

**NASA Contractor Report 177343 - vol-1**

# **Propulsion and Airframe Aerodynamic Interactions of Supersonic V/STOL Configurations**

## **Volume I: Wind Tunnel Test Pressure Data Report**

**D.E. Zilz  
P.A. Devereaux**

**CONTRACT NAS2-18791  
SEPTEMBER 1983**

**(NASA-CR-177343-Vol-1) PROPULSION AND  
AIRFRAME AERODYNAMIC INTERACTIONS OF  
SUPERSONIC V/STOL CONFIGURATIONS. VOLUME 1:  
WIND TUNNEL TEST PRESSURE DATA REPORT  
(McDonnell Aircraft Co.) 885 p**

**N88-22866**

**Unclas  
0142914**

**CSCL 01A G3/02**

**Date for general release: August 1987.**

**NASA**

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# **Propulsion and Airframe Aerodynamic Interactions of Supersonic V/STOL Configurations**

## **Volume I: Wind Tunnel Test Pressure Data Report**

**D.E. Zilz**  
**P.A. Devereaux**  
*McDonnell Aircraft Company*  
*St. Louis, Missouri*



**Prepared for**  
**Ames Research Center**  
**under Contract NAS2-10791**  
**September 1985**



National Aeronautics and  
Space Administration

**Ames Research Center**  
Moffett Field, California 94035



## FOREWORD

This report was prepared by McDonnell Aircraft Company (MCAIR), a component of McDonnell Douglas Corporation, St. Louis, Missouri, for the National Aeronautics and Space Administration, Ames Research Center. The study was performed under NASA Contract NAS2-10791, "Propulsion and Airframe Aerodynamic Interactions of Supersonic V/STOL Configurations". The work was performed from October 1980 through September 1985 with R. O. Bailey as the NASA ARC Technical Representative. The program was accomplished under the direction of P. E. Hiley, Program Manager and H. W. Wallace, Technical Study Manager.

Acknowledgement is also given to S. C. Smith and J. B. Gustie of NASA ARC for their efforts during the calibrations, wind tunnel tests, and data analysis at the NASA ARC Unitary Plan 11-Foot Transonic Wind Tunnel.

This report was prepared by P. A. Devereaux and D. F. Zilz of MCAIR. The authors are indebted to the following MCAIR personnel for their assistance during the study: M. R. Mraz, A. V. Arena, and M. E. Booher of Propulsion and Thermodynamics.

The authors also commend J. C. Poole, W. Cerski, and C. C. Smithson of the MCAIR Aerodynamics and Propulsion Laboratories for their efforts in the design and testing of the wind tunnel models.

Special acknowledgements are also due K. H. Token and D. W. Esker of MCAIR (Propulsion and Thermodynamics), who, in their supervisory positions, have made valuable contributions to the program and this report.

This report was submitted in four volumes by the authors in September 1985.

# TABLE OF CONTENTS

<u>Section</u>		<u>Page</u>
1.	INTRODUCTION . . . . .	1
2.	TEST ARTICLE DESCRIPTION . . . . .	4
2.1	TEST MODES . . . . .	7
2.1.1	CMAPS Mode . . . . .	8
2.1.2	Jet-Effects Mode . . . . .	11
2.1.3	Flow-Through Mode . . . . .	13
2.2	INLET/EXHAUST SYSTEMS . . . . .	14
2.2.1	Inlet Systems . . . . .	14
2.2.2	Exhaust Systems . . . . .	16
2.3	TEST CONFIGURATIONS . . . . .	19
2.3.1	Common Baseline Configuration . . . . .	19
2.3.2	Nozzle Extension Configuration . . . . .	19
2.3.3	Nozzle Extension Baseline Configuration . . . . .	19
2.3.4	Simulated Aircraft Configuration . . . . .	21
3.	PRESSURE INSTRUMENTATION . . . . .	22
3.1	EXTERNAL PRESSURE INSTRUMENTATION . . . . .	22
3.1.1	Outer Wing . . . . .	22
3.1.2	Inner Wing . . . . .	22
3.1.3	Fuselage . . . . .	22
3.1.4	Nacelle . . . . .	26
3.1.5	Nozzle . . . . .	26
3.2	COMPRESSOR FACE PRESSURE INSTRUMENTATION . . . . .	28
4.	REFERENCES . . . . .	31
APPENDIX A	WIND TUNNEL TEST RESULTS: PRESSURE DATA . . . . .	33
APPENDIX B	SCANIVALVE PORT ASSIGNMENTS . . . . .	855
APPENDIX C	TEST MATRICES . . . . .	865

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# LIST OF ILLUSTRATIONS

<u>Figure</u>		<u>Page</u>
1-1	Compact Multimission Aircraft Propulsion Simulator (CMAPS) . . . . .	1
1-2	Aerodynamic Characteristics of Study Concepts . .	3
2-1	Air-to-Air Model Installed in NASA-Ames Transonic Wind Tunnel . . . . .	4
2-2	Test Mode Characteristics . . . . .	5
2-3	Comparison of Test Configurations . . . . .	6
2-4	Inlet/Nozzle Combinations Tested in Each Mode . .	7
2-5	Common Support System and Metric Arrangement . . .	7
2-6	Interchangeable Nacelle Core Hardware . . . . .	8
2-7	Propulsion Simulator Installed in Left Hand Engine Nacelle . . . . .	9
2-8	CMAPS Mode Nacelle Core Hardware . . . . .	10
2-9	Simulator Internal Flow Paths . . . . .	11
2-10	Jet-Effects Mode Nacelle Core Hardware . . . . .	12
2-11	Flow-Through Mode Nacelle Core Hardware . . . . .	13
2-12	Ejector Apparatus Connected to Nozzle Extensions .	14
2-13	Flowing Inlet System with 0° Cowl Lip Rotation . .	15
2-14	Flowing Inlet System with 45° Cowl Lip Rotation .	15
2-15	Faired Inlet System on Test Vehicle . . . . .	16
2-16	Untested Inlet for Alternate Configuration . . . .	17
2-17	Unvectored A/B ALBEN System on Test Vehicle . . .	18
2-18	Nozzle Extension System on Test Vehicle . . . . .	18
2-19	Test Summary . . . . .	20
2-20	Nozzle Extension Configuration with Wing Flaps Deflected 30° . . . . .	21

# LIST OF ILLUSTRATIONS (Concluded)

<u>Figure</u>		<u>Page</u>
3-1	Location of Model External Pressure Instrumentation . . . . .	23
3-2	Outer Wing Pressure Instrumentation BL 12.825 on Left Wing . . . . .	24
3-3	Outer Wing Pressure Instrumentation on Right Wing . . . . .	25
3-4	Center Fuselage, Inner Wing, and Nacelle Pressure Instrumentation . . . . .	25
3-5	Right Hand Nacelle Side Pressure Instrumentation .	26
3-6	ALBEN External Pressure Instrumentation . . . . .	27
3-7	Nozzle Extension Tube External Pressure Instrumentation . . . . .	27
3-8	Compressor Face Total Pressure Rake . . . . .	28
3-9	Right Hand Compressor Face Rake Layout . . . . .	29
3-10	Left Hand Compressor Face Rake Layout . . . . .	30
A-1	Region of Validity for Compressor Face Recovery Distributions . . . . .	34

# LIST OF ABBREVIATIONS AND SYMBOLS

<u>Symbol</u>	<u>Definition</u>
A/B	Afterburning power setting on nozzle
A <sub>c</sub>	Inlet capture area (35.23cm <sup>2</sup> )
A <sub>o</sub>	Total inlet captured stream tube area (cm <sup>2</sup> )
ALBEN	Aerodynamically Load Balanced Exhaust Nozzle
ALPHA, ALPHAM	Model angle of attack (Deg)
b <sub>c</sub>	Model canard span (52.49cm)
b <sub>w</sub>	Model wing span (130.30cm)
B.L.	Model butt line
$\bar{c}_c$	Mean aerodynamic canard chord (19.60cm)
$\bar{c}_w$	Mean aerodynamic wing chord (41.70cm)
C <sub>p</sub>	Pressure coefficient $[(P_L - P_o)/Q_o]$
CMAPS	Compact Multimission Aircraft Propulsion Simulator
DELCR	Right hand canard deflection angle, positive leading edge up (Deg)
DELCL	Left hand canard deflection angle, positive leading edge up (Deg)
DF <sub>1R</sub>	Total pressure distortion parameter at right hand compressor face, $[(P_{T_{max}} - P_{T_{min}})/P_{T_2}]$
Dry	Dry power setting on nozzle
ES	Engine station
F/T, FT	Flow-Through test mode
FS	Fuselage Station
J/E, JE	Jet-Effects test mode
Mach, M	Free stream Mach number
MCAIR	McDonnell Aircraft Company

# LIST OF ABBREVIATIONS AND SYMBOLS (CONTINUED)

<u>Symbol</u>	<u>Definition</u>
MFR, MFRA	Average of left and right Inlet Mass Flow Ratios based on calibration correlated to CMAPS turbine exit pressure for Simulator Mode or at nozzle exit chokes for Flow-Through Mode, [ $A^0/A_c$ ]
MS	Model Station
NPR, NPRA	Average of left and right Nozzle Pressure Ratios [ $P_{T_J}/P_o$ ]
P, $P_o$	Free Stream static pressure
$P_L$	Local Static Pressure
$P_T$ , $P_{T_o}$	Free stream total pressure
$P_{T_2}$	Average total pressure at compressor face, left or right
$P_{T_{max}}$	Maximum value of total pressure of compressor face
$P_{T_{min}}$	Minimum value of total pressure at compressor face
$P_{T_J}$	Total pressure of jet exhaust at nozzle exit
Q, $Q_o$	Free stream dynamic pressure
R _____	"R" preceeding any parameter indicates Reference value for all points in a given run; usually the value measured at $\alpha = 0^\circ$
RECLR	Total pressure recovery at right hand compressor face, [ $P_{T_2}/P_{T_o}$ ]
SIM	Simulator test mode
WL	Model water line
$\alpha$	ALPHA
$\delta_c$	DELCR or DELCL
$\delta_f$	Wing flap deflection angle, positive trailing edge down (Deg)
$\delta_n$	Nozzle thrust vectoring angle, positive trailing edge down (Deg)

## SUMMARY

A wind tunnel model of a supersonic V/STOL fighter configuration has been tested to measure the aerodynamic interaction effects which can result from geometrically close-coupled propulsion system/airframe components. The approach was to configure the model to represent two different test techniques. One was a conventional test technique composed of two test modes. In the Flow-Through mode, absolute configuration aerodynamics are measured, including inlet/airframe interactions. In the Jet-Effects mode, incremental nozzle/airframe interactions are measured. The other test technique is a propulsion simulator approach, where a sub-scale, externally powered engine is mounted in the model. This allows proper measurement of inlet/airframe and nozzle/airframe interactions simultaneously.

Comparison of the measured aerodynamic characteristics between the two test techniques is a direct indication of the extent to which inlet and nozzle flowfields are coupled together. If significant coupling does exist, there will be disagreement between the two data sets. The simulator test technique may then be required in the future to properly measure the aerodynamic characteristics of compact fighter configurations.

Measurement of these propulsion/airframe interaction effects was carried out in a three phase experimental program, sponsored by the NASA Ames Research Center. Conceptual model design was accomplished in Phase 1, detailed model design and fabrication in Phase 2, and high speed testing in Phase 3.

The aerodynamic configuration tested was a canard/wing concept designed for high transonic maneuverability, employing non-axisymmetric, vectorable exhaust nozzles located near the wing trailing edge.

The overall character of the aerodynamic flowfield, including the interactions due to inlet/nozzle coupling, were quantified by comparing force balance data between the different test modes, and by comparing static pressure distributions over the entire model surface. The purpose of this Volume I report is to document the pressure data in detail. The Volume II report documents the basic force and moment data, Reference 1. All of the analysis for both pressure and force and moment data is presented in the Volume III Test Analysis Report, Reference 2.

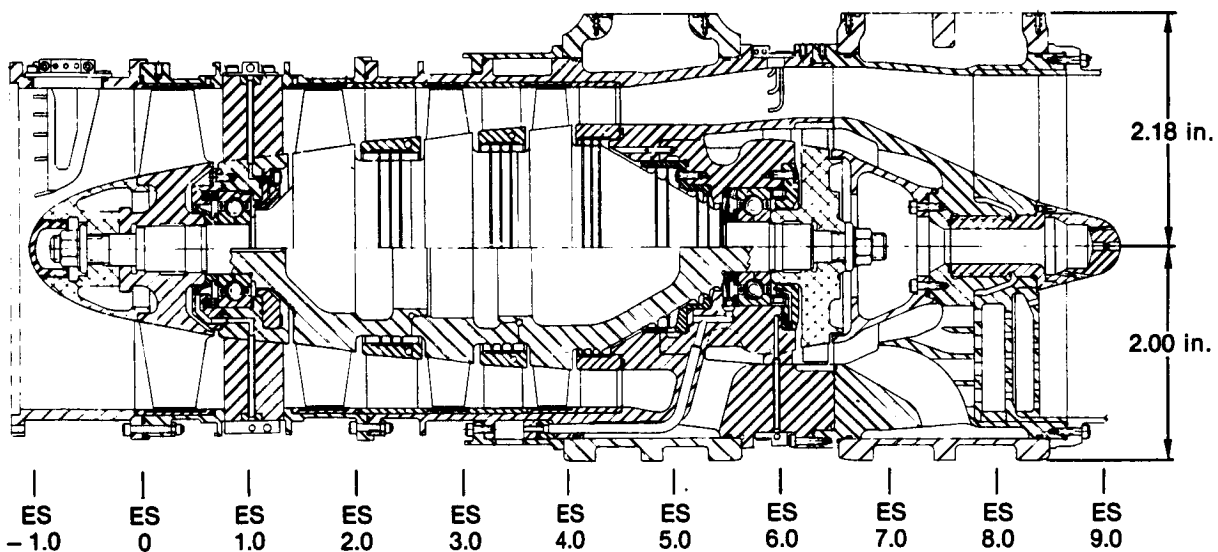
The static pressure data contained herein is based on measurements made with 145 surface taps located on the wings, fuselage, nacelles and nozzles. The compressor face pressure characteristics are based on 25 total pressure probes in each inlet.



## 1. INTRODUCTION

Many of the configurations proposed for advanced supersonic V/STOL aircraft are very compact in nature. This results primarily from the design goal to minimize control forces and forward lift engine size by concentrating the major components of the aircraft near the center of gravity. Integration of the propulsion system with the airframe for these configurations can result in potentially significant aerodynamic flowfield interactions. These interactions may arise from geometrically close-coupled inlet/nozzle arrangements arising from minimum length nacelles. The problem can be further complicated if the configuration includes movable canards and vectorable nozzles located near the wing.

The data obtained with conventional wind tunnel test techniques can be questionable in the presence of large flowfield interactions, since these techniques cannot achieve simultaneous simulation of all of the flowfields involved. Proper simulation can be achieved with the compact Multi-Mission Aircraft Propulsion Simulator (CMAPS), developed by the Air Force Aeropropulsion Laboratory (AFAPL), Reference 3. The CMAPS, Figure 1-1, is a miniature, low bypass ratio turbofan engine powered by a high pressure air turbine.



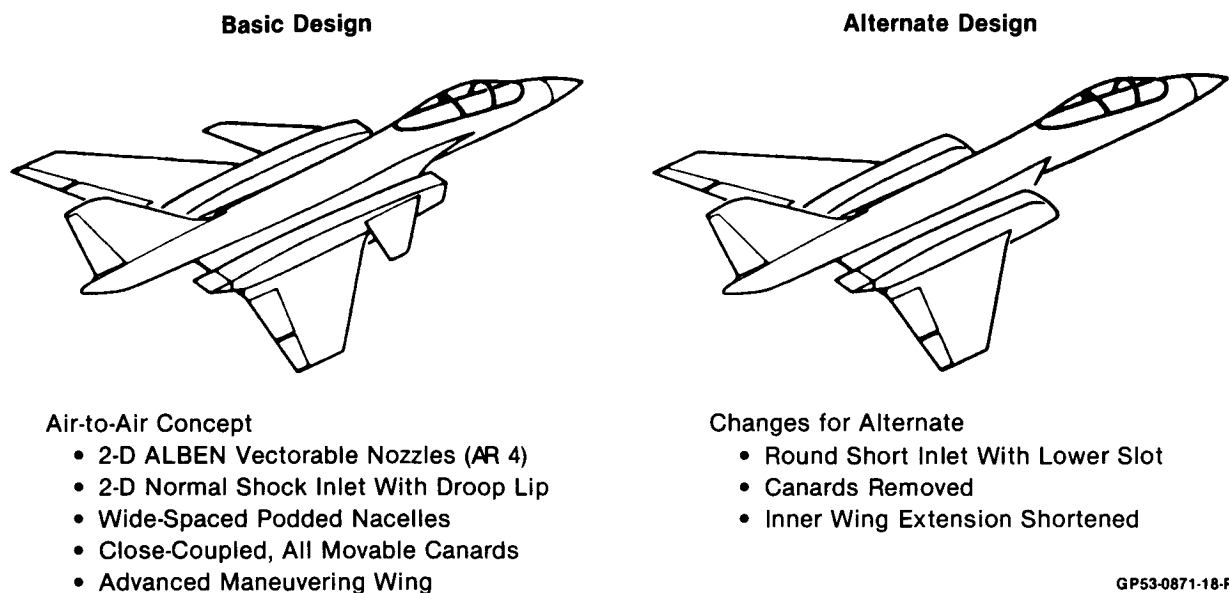
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Figure 1-1. Compact Multimission Aircraft Propulsion Simulator (CMAPS)

The most beneficial application of the CMAPS will obviously be on those aircraft that have potentially large flowfield interactions between the inlet, nozzle, and airframe. Since testing a CMAPS equipped model may be more complex than testing a conventional model (Flow-Through and Jet-Effects), the need to identify the types of configurations which require CMAPS evaluation is critical. An aerodynamically close-coupled V/STOL configuration represents an effective means of evaluating the requirement for simultaneous inlet and exhaust nozzle flow simulation, and thus the potential need for the CMAPS testing technique.

Based on the foregoing considerations, a three phase NASA program was initiated in October, 1980 to measure airframe/propulsion system interactions of close-coupled supersonic V/STOL configurations. Both propulsion simulator and conventional model techniques were used. An equally important objective was to continue development of installation and test techniques for wind tunnel models equipped with propulsion simulators. This program represented the first time that twin CMAPS had been tested in a wind tunnel model of a full configuration aircraft. Previous programs have tested only single simulators in simple body/nacelle models, Reference 4.

The approach to accomplish these objectives was to design, fabricate, and test two model configurations characterized by close-coupled airframe/propulsion arrangements, each in simulator and conventional test modes. Key characteristics of the two test configurations are shown in Figure 1-2. The external airframe components of the basic model were provided by the Air Force. This basic configuration was developed under prime contract to the Air Force Wright Aeronautical Laboratories (AFWAL) by MCAIR in the Advanced Nozzle Concepts (ANC) program, Reference 5. The alternate configuration is a derivative of the basic configuration with the inlet/nozzle length shortened and the canard removed. At this time, only the basic configuration has been tested. However, the hardware has been fabricated to model the alternate configuration.



**Figure 1-2. Aerodynamic Characteristics of Study Concepts**

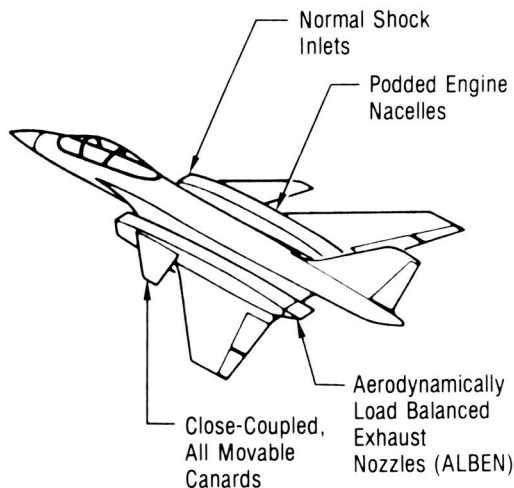
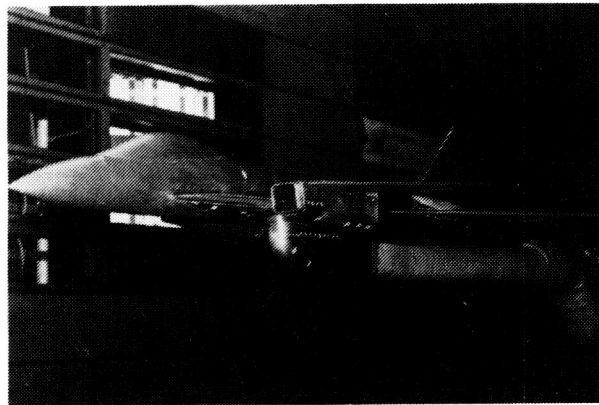
Conceptual design of the test model was completed in Phase 1 during the first seven months of the program, Reference 6. Detailed design and model fabrication were accomplished in Phase 2, as reported in Reference 7.

The results of the Phase 3 wind tunnel tests and analysis are presented in a series of four NASA Contractor Reports (CRs). The pressure data is reported in this Volume I of the Wind Tunnel Data Report. The force and moment data and data reduction procedures are reported in Volume II, (Reference 1). The detailed data analysis and executive summary are presented in the Test Analysis Report and Final Report respectively (References 2 and 8).

The following sections include a description of the test article and the pressure instrumentation. The pressure data is presented graphically in Appendix A of this volume.

## 2. TEST ARTICLE DESCRIPTION

The test vehicle was a 9.62% scale model of a supersonic V/STOL aircraft with twin, podded engine nacelles. The nacelles incorporated normal shock inlets and vectorable Aerodynamically Load Balanced Exhaust Nozzles (ALBENs), designed by General Electric. The model installed in the NASA-Ames 11x11-ft transonic wind tunnel is shown in Figure 2-1. Testing was performed at speeds from Mach 0.4 to 1.4 and through the angle-of-attack range from  $-2^\circ$  to  $20^\circ$ .



### Model Geometry

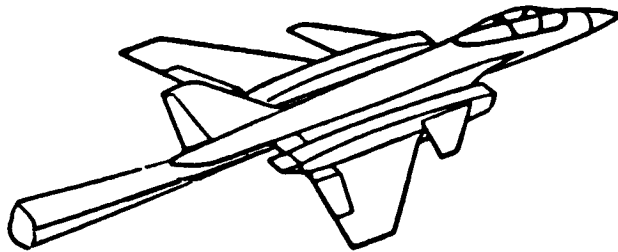
Fuselage Length:	1.79 m (5.88 ft)
Nacelle Length:	0.86 m (2.83 ft)
Wing Span:	1.30 m (4.28 ft)
Wing Area:	0.48 m <sup>2</sup> (5.22 ft <sup>2</sup> )
Canard Area:	0.09 m <sup>2</sup> (1.02 ft <sup>2</sup> )
Inlet Capture Area:	35.23 cm <sup>2</sup> (5.46 in. <sup>2</sup> )
Nacelle Max Area:	116.14 cm <sup>2</sup> (18 in. <sup>2</sup> )
Nozzle Throat Area (Dry):	19.42 cm <sup>2</sup> (3.01 in. <sup>2</sup> )
Nozzle Throat Area (A/B):	33.23 cm <sup>2</sup> (5.15 in. <sup>2</sup> )

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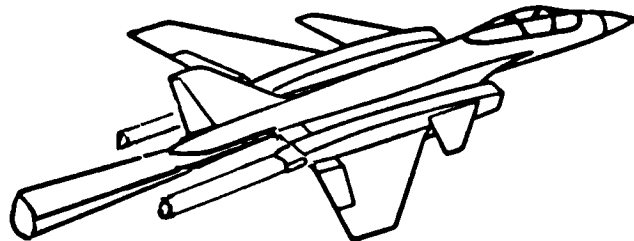
**Figure 2-1. Supersonic V/STOL Wind Tunnel Model Installed in NASA-Ames Transonic Tunnel**

The model was tested in three different modes; the conventional Jet-Effects and Flow-Through modes, and the propulsion simulator (CMAPS) mode. A schematic of the three modes, each in its characteristic configuration, is shown in Figure 2-2.

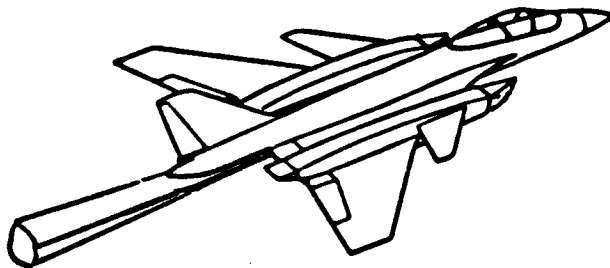
**Simulator Mode**



**Flow-Through Mode**



**Jet-Effects Mode**

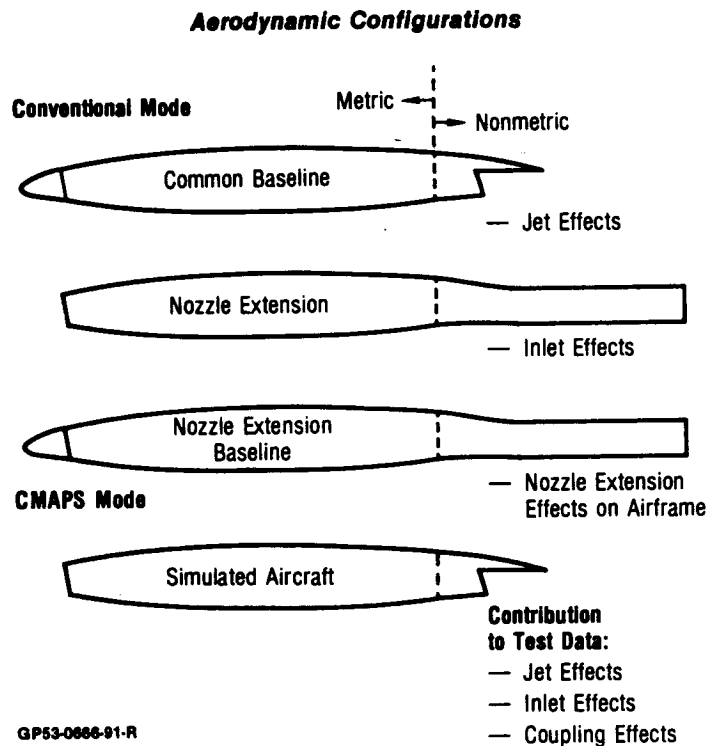


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**Figure 2-2. Test Mode Characteristics**

Within the three test modes, a matrix of two inlet and two exhaust system configurations was tested. The inlet was configured as either flowing or faired. The exhaust system incorporated either ALBENs or nozzle extension ducts with chokes installed. Four aerodynamically different test configurations were derived from the two inlet and two exhaust configurations. These configurations were termed: 1) Common Baseline, 2) Nozzle Extension, 3) Nozzle Extension Baseline, and 4) Simulated Aircraft. The external differences in these configurations were only in the nacelle geometry, Figure 2-3; all other external model features were common. A matrix of the modes, inlet/nozzle

combinations, and test configurations is shown in Figure 2-4. The Common Baseline configuration was tested in each mode as a tie-in for the three separate model build-ups and used to account for any bias errors created between tunnel entries. The Nozzle Extension configuration used the extension ducts to displace the exhaust plume from the vicinity of the airframe such that inlet mass flow ratio (MFR) effects could be measured independent of jet-induced effects. The Nozzle Extension Baseline configuration was used to account for the effects of the extension ducts on the metric airframe as compared to the ALBEN installation. Of the four configurations tested, the Simulated Aircraft configuration is the best representation of an aircraft in flight.



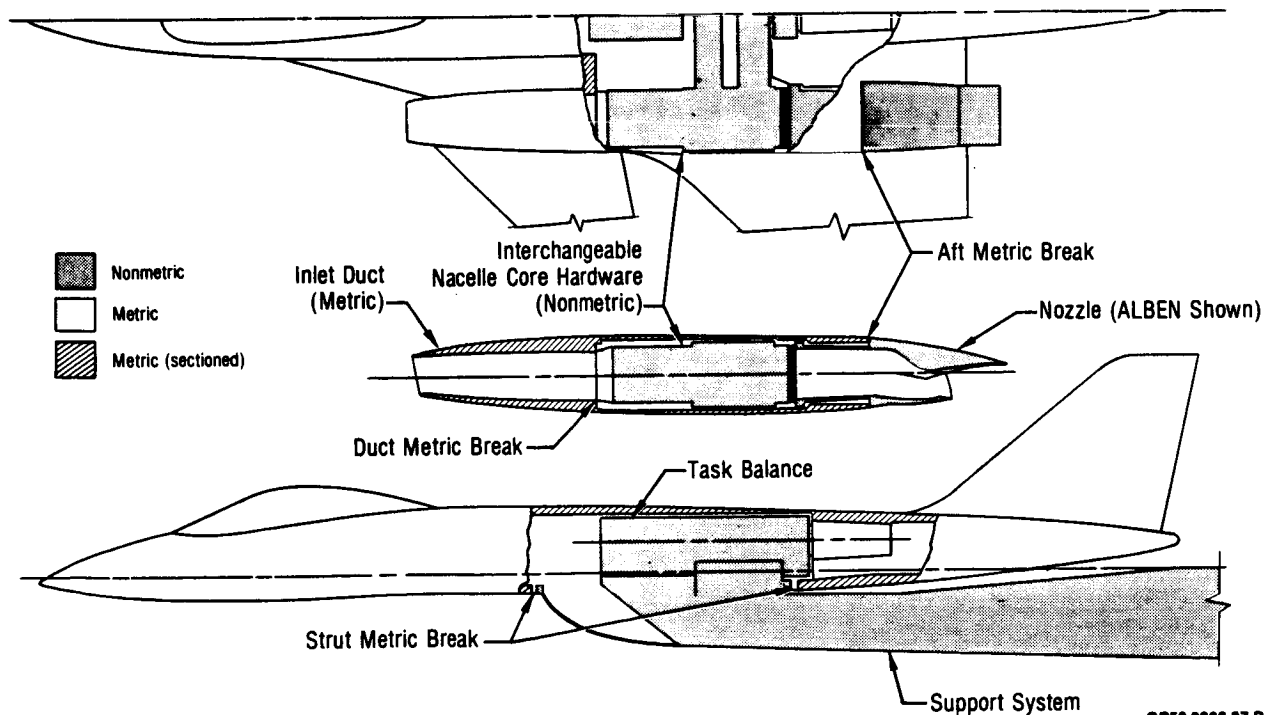
**Figure 2-3. Comparison of Test Configuration**

Test Configuration	Propulsion System Configuration		Test Mode		
	Inlet	Nozzle	Jet-Effects	Flow-Through	CMAPS
Simulated Aircraft	Flowing	ALBEN			X
Common Baseline	Faired	ALBEN	X	X	X
Nozzle Extension	Flowing	Extensions		X	X
Nozzle Extension Baseline	Faired	Extensions		X	

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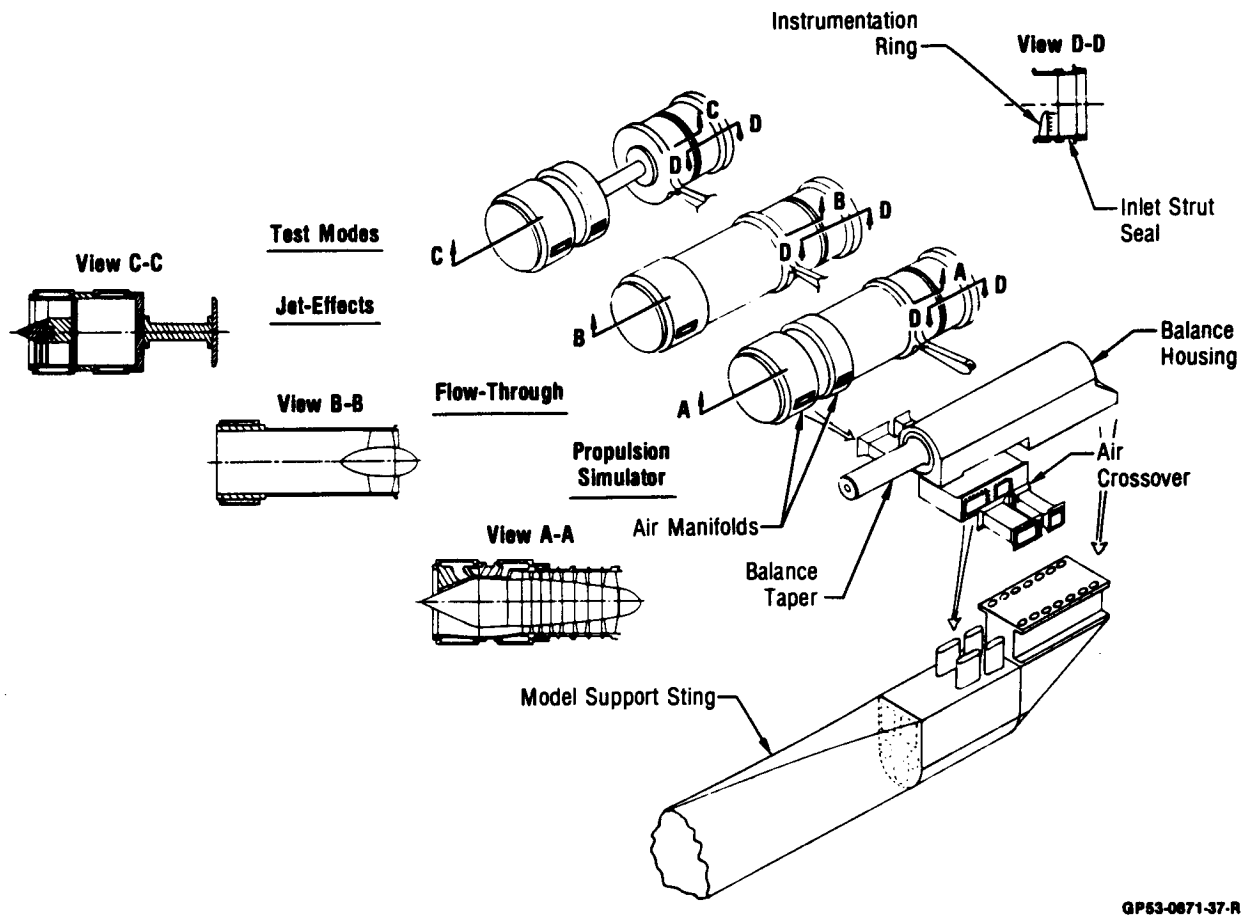
**Figure 2-4. Inlet/Nozzle Combinations Tested in Each Mode**

**2.1 TEST MODES** - Each of the three test modes (CMAPS, Jet-Effects, and Flow-Through) represented a different wind tunnel test technique. A major program objective was to eliminate bias errors due to test technique differences. Therefore, a common support system and a common metric arrangement were used for all three test modes, Figure 2-5. The internal flow hardware was unique to each test mode but interchangeable between the three modes, as shown in Figure 2-6. The flow path through the nacelle could be changed by installing a simulator, a jet-effects plenum, or a flow-through duct, depending on the test mode desired.



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**Figure 2-5. Common Support System and Metric Arrangement**



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**Figure 2-6. Interchangeable Nacelle Core Hardware**

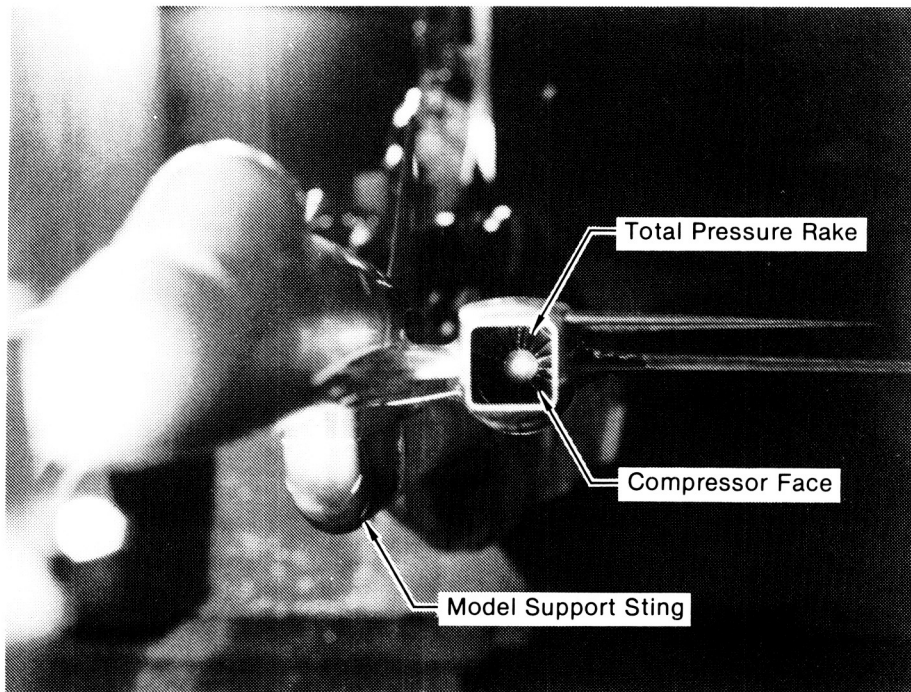
2.1.1 CMAPS Mode - Propulsion simulators were placed in the engine nacelles for all the CMAPS mode testing. The Station 2 total pressure rake and simulator compressor face can be seen behind the close-coupled inlet in Figure 2-7. A schematic of the nacelle hardware for the CMAPS mode is shown in Figure 2-8.

Independent control of the high pressure air through the drive and bleed lines in the support sting allowed the simulator to produce desired combinations of inlet and nozzle flow conditions independently. A schematic of the simulator flow path is shown in Figure 2-9.

The Simulated Aircraft and the Nozzle Extension configurations, as well as the Common Baseline configuration, were all tested in the CMAPS mode. Data was acquired for the Simulated



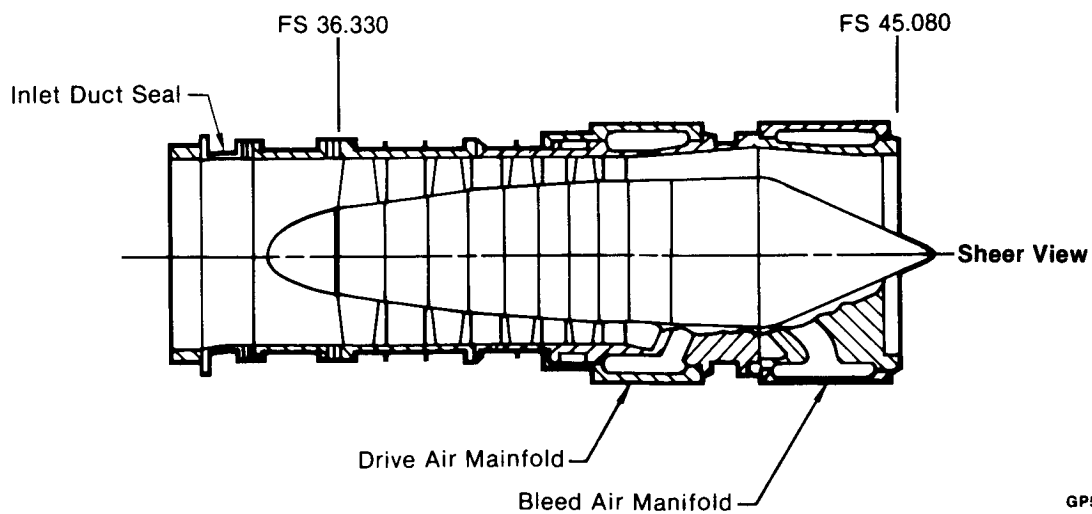
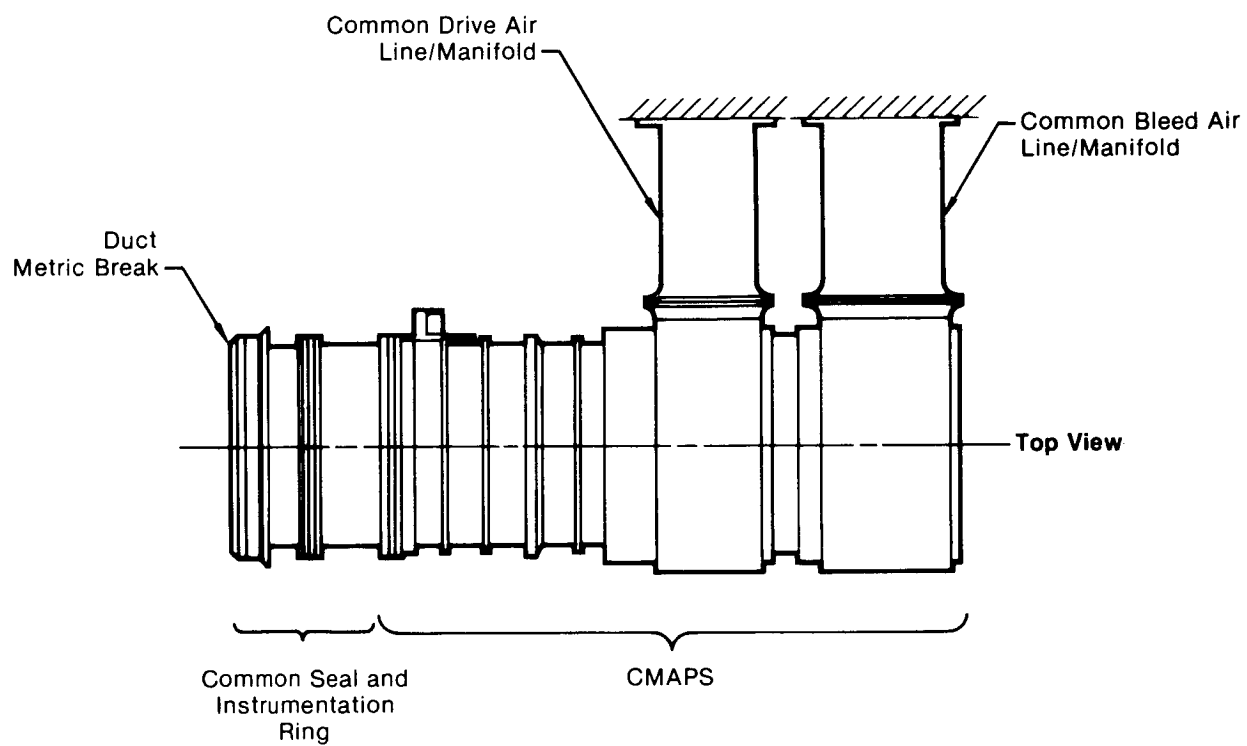
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**Figure 2-7. Propulsion Simulator Installed in Left Hand Engine Nacelle**

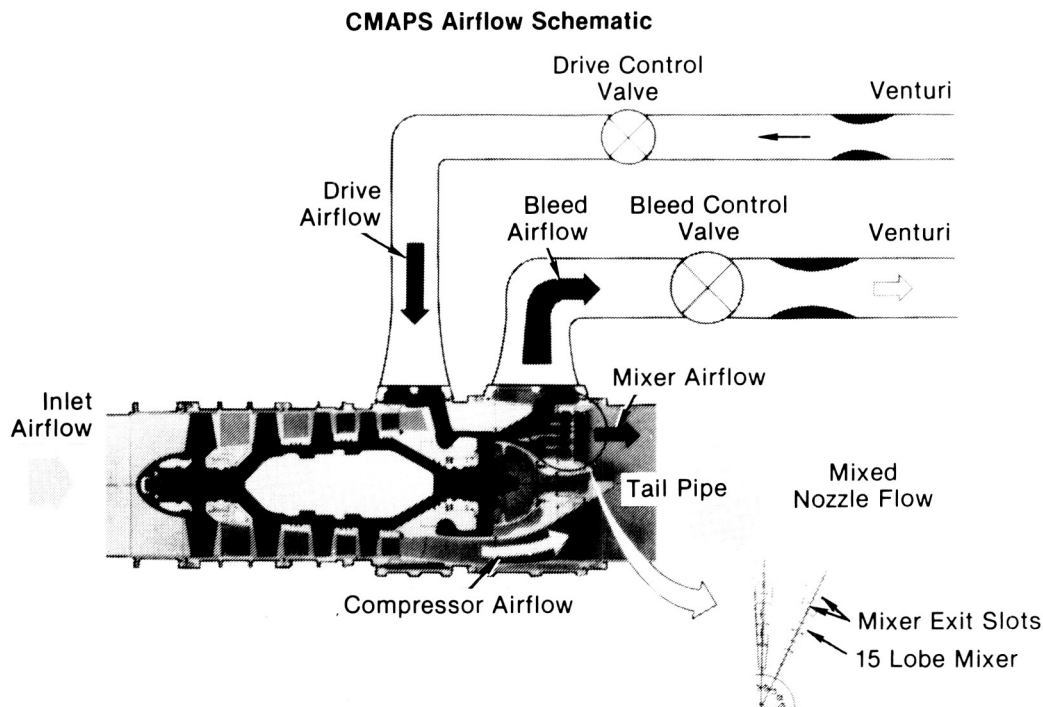
Aircraft configuration in the form of angle-of-attack (AOA) sweeps and engine pressure ratio (EPR) sweeps. The Nozzle Extension configuration data was taken for AOA sweeps at various canard angles and MFRs. Only the largest exit area chokes were used in the Nozzle Extension configuration for this mode. MFR was controlled solely by the simulators. The Common Baseline configuration was tested in each test mode to isolate tunnel induced effects. A complete run matrix for the CMAPS mode is included in Appendix C.



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**Figure 2-8. CMAPS Mode Nacelle Core Hardware**

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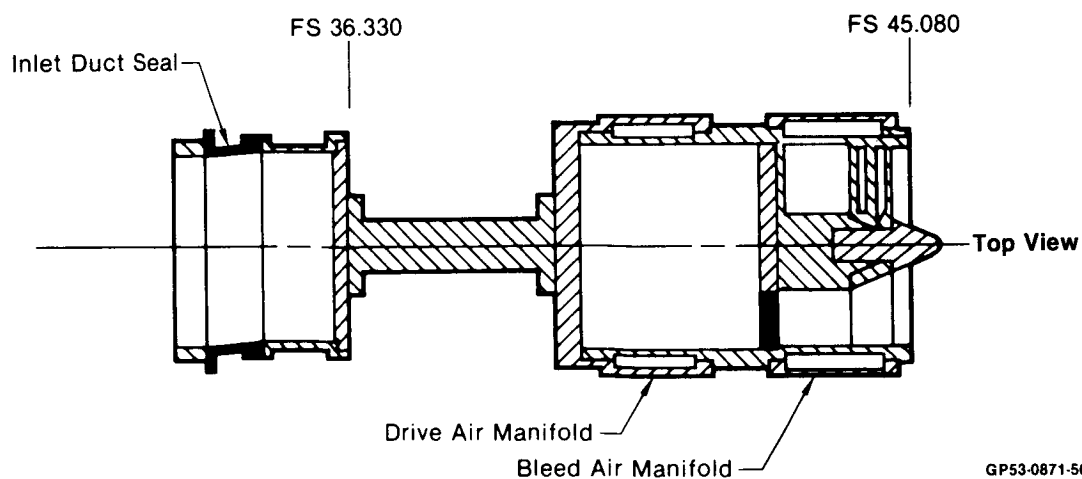
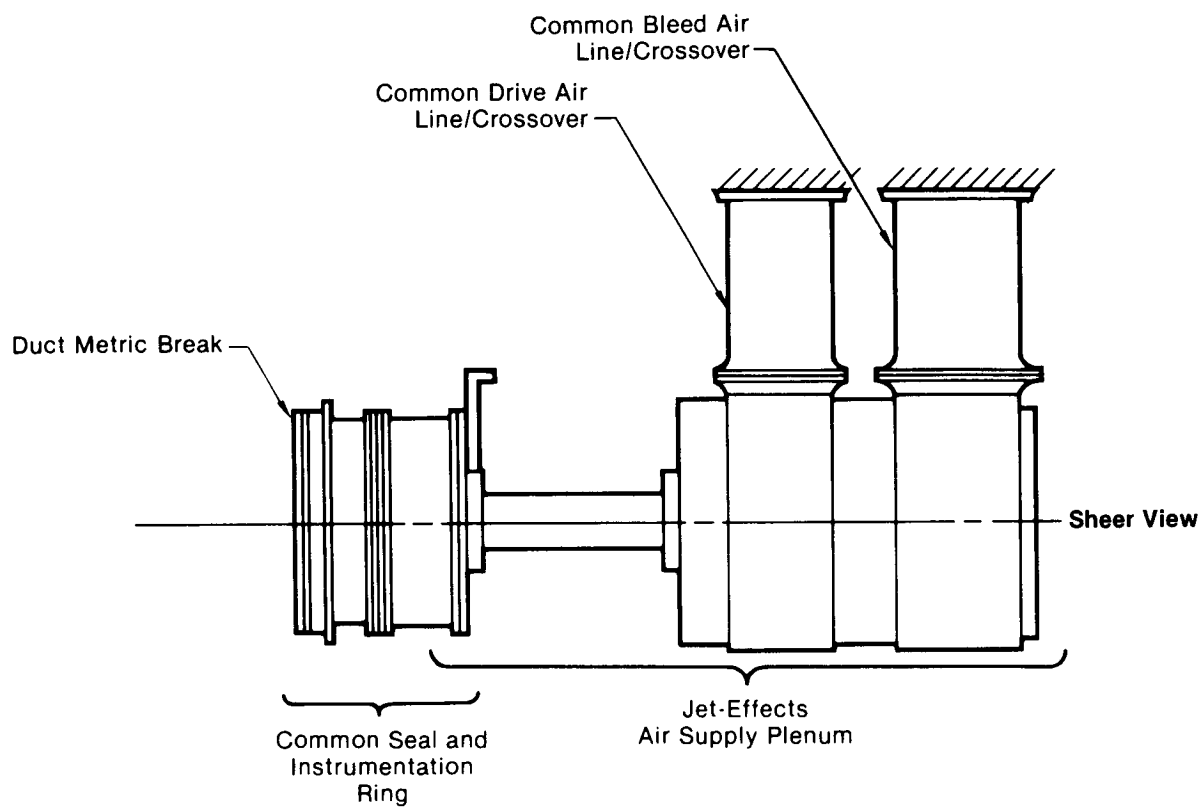


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**Figure 2-9. Simulator Internal Flow Paths**

2.1.2 Jet-Effects Mode - Plenum chambers replaced the simulators in the engine nacelles during the Jet-Effects mode testing. The nacelle hardware for the Jet-Effects mode is shown in Figure 2-10. The drive and bleed lines in the support sting both supplied high pressure air to the plenum. The air was then mixed and exhausted through the ALBEN's. This plenum design was intended to duplicate the internal airflow paths used in the CMAPS mode. Although not required, the inlet duct seal was retained during the Jet-Effects mode in order to maintain a common seal arrangement between the three test modes.

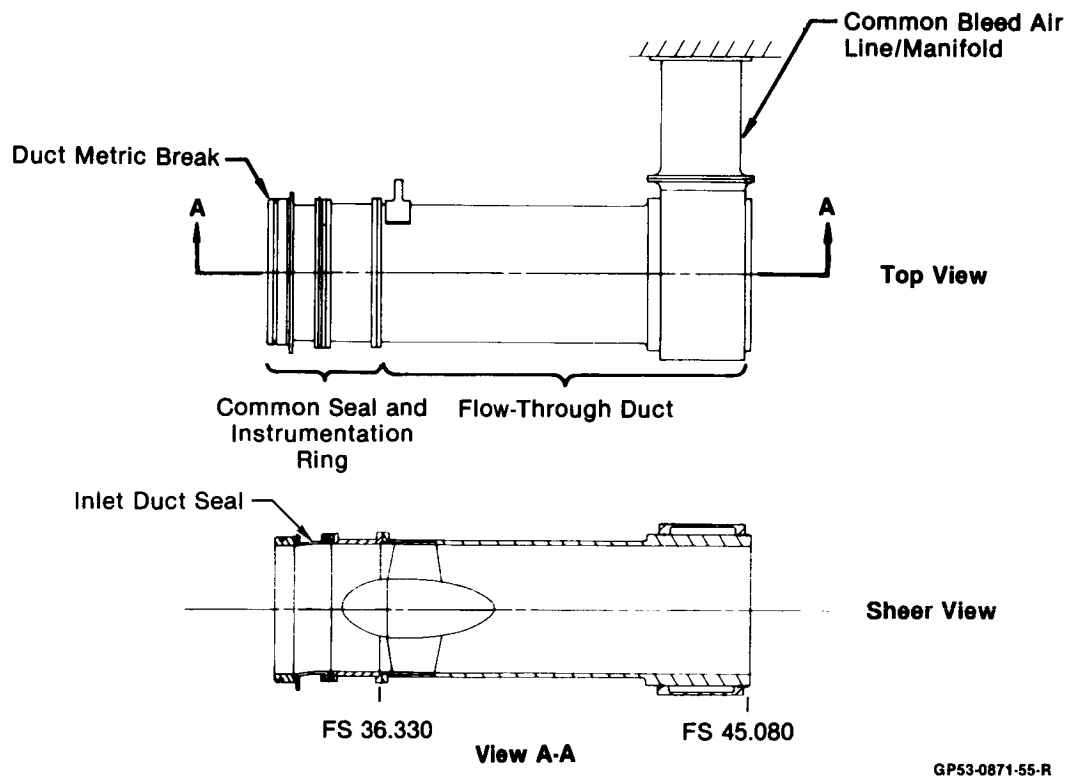
Only the Common Baseline configuration was tested in this mode. Data was acquired with jet-on and jet-off AOA sweeps and nozzle pressure ratio (NPR) sweeps. A complete run matrix for the Jet-Effects mode is included in Appendix C.



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**Figure 2-10. Jet-Effects Mode Nacelle Core Hardware**

2.1.3 Flow-Through Mode - Flow-through ducts were interchanged with the plenum chambers or simulators to build-up the Flow-Through mode. The non-metric duct units, Figure 2-11, were designed to model the propulsion simulators with respect to the on-coming inlet flow. Therefore, the Station 2 total pressure rakes, inlet duct seals, and compressor face hubs were identical for Flow-Through and Simulator modes.



**Figure 2-11. Flow-Through Mode Nacelle Core Hardware**

The Nozzle Extension configuration and the Nozzle Extension Baseline, as well as the Common Baseline, were tested in this mode. Inlet MFR was controlled in the Nozzle Extension configuration with four nozzle chokes sized as follows: 12.49 cm<sup>2</sup>, 18.74 cm<sup>2</sup>, 26.11 cm<sup>2</sup>, and 34.25 cm<sup>2</sup>. An ejector system was connected to the extension assemblies for Mach 0.4 and 0.6 testing, since the ram air was not sufficient to simulate maximum airflow. The ejector installation is shown in Figure 2-12. The data was acquired with AOA sweeps at constant canard angles and inlet MFRs as shown in Appendix C.

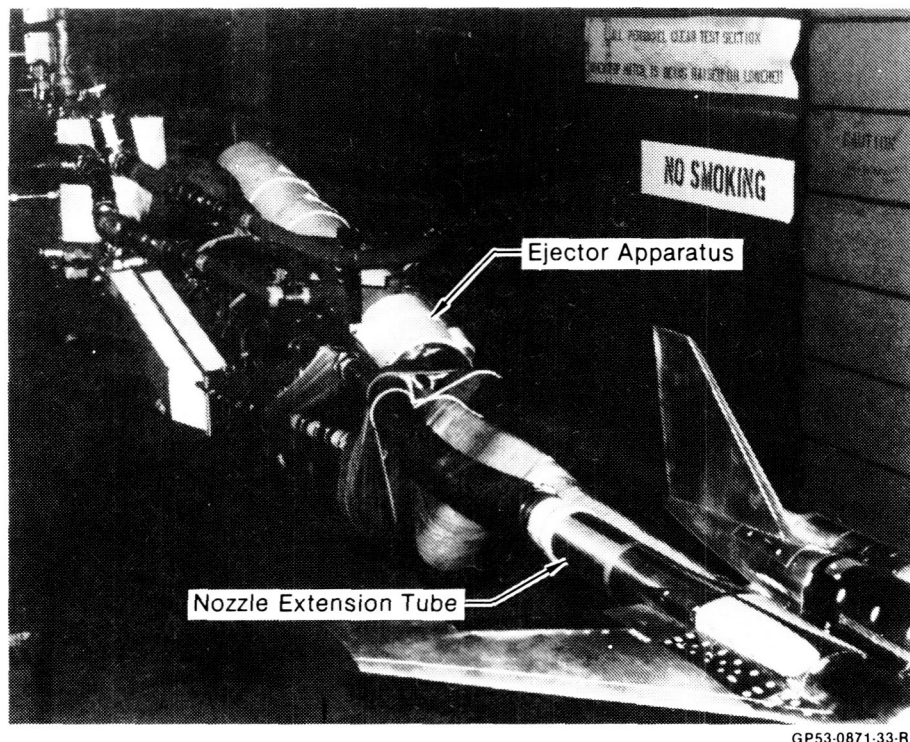


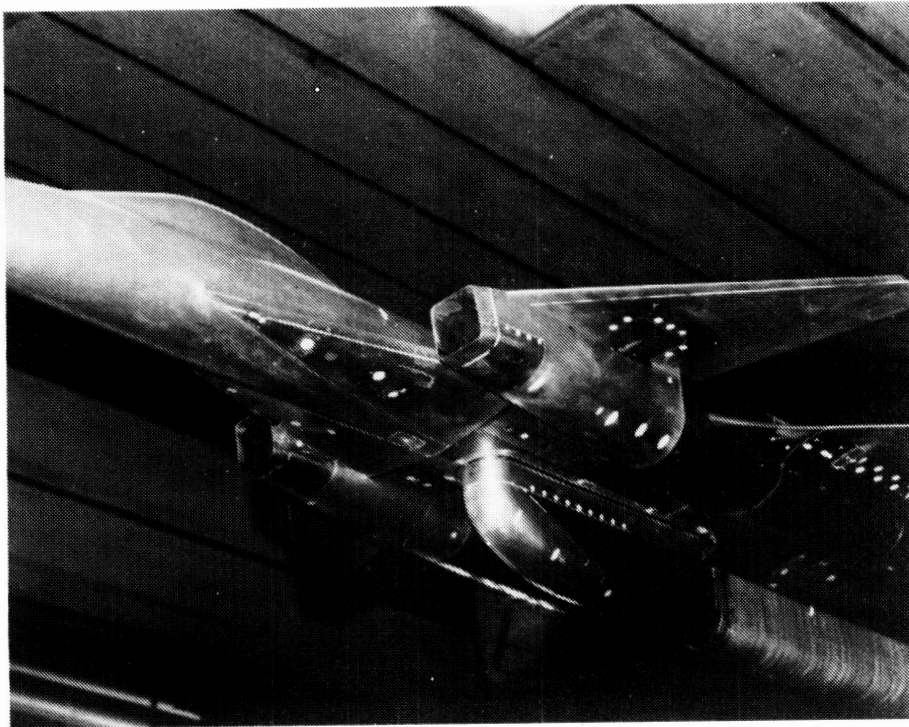
Figure 2-12. Ejector Apparatus Connected to Nozzle Extensions

2.2 INLET/EXHAUST SYSTEMS - Two inlet and two exhaust systems were tested on the twin podded engine nacelles.

2.2.1 Inlet Systems - The inlet was tested in both a flowing and a faired configuration. The flowing inlet was a rectangular, normal shock design with 15° scarf angle and a rotating lower cowl lip. The flowing inlet system with 0° and 45° cowl lip rotations is shown in Figures 2-13 and 2-14 respectively. The lower cowl lip is rotated down to reduce flow separation around this cowl at high angle-of-attack conditions. A limited amount of testing was performed on the 45° lip rotation configuration.

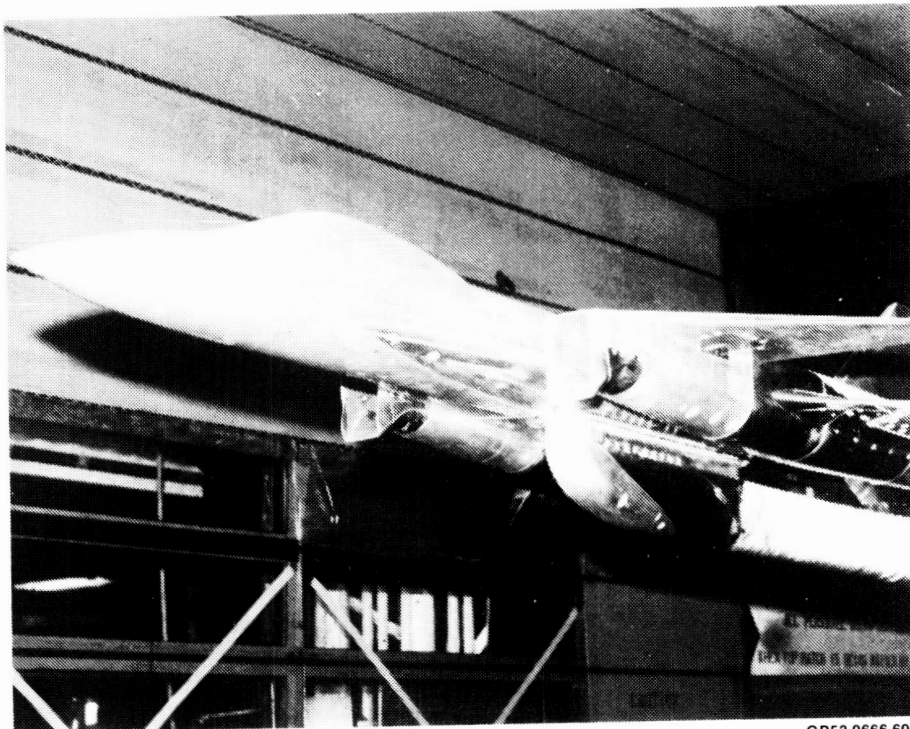
The faired inlet configuration was formed by installing pyramidal fairings to the flowing inlets with 0° lip rotation. The fairing shapes represented simple forward extensions of the local cowl moldlines. The model with the faired inlet system is shown in Figure 2-15.

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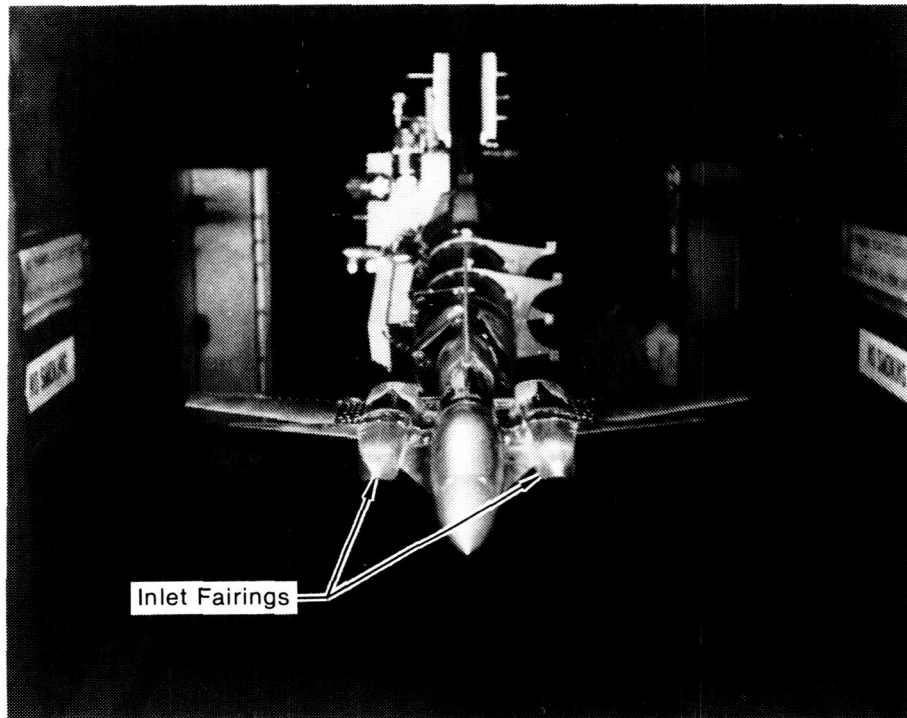
GP53-0871-26-R

Figure 2-13. Flowing Inlet System With 0° Cowl Lip Rotation



GP53-0666-60-R

Figure 2-14. Flowing Inlet System With 45° Cowl Lip Rotation



GP53-0871-32-R

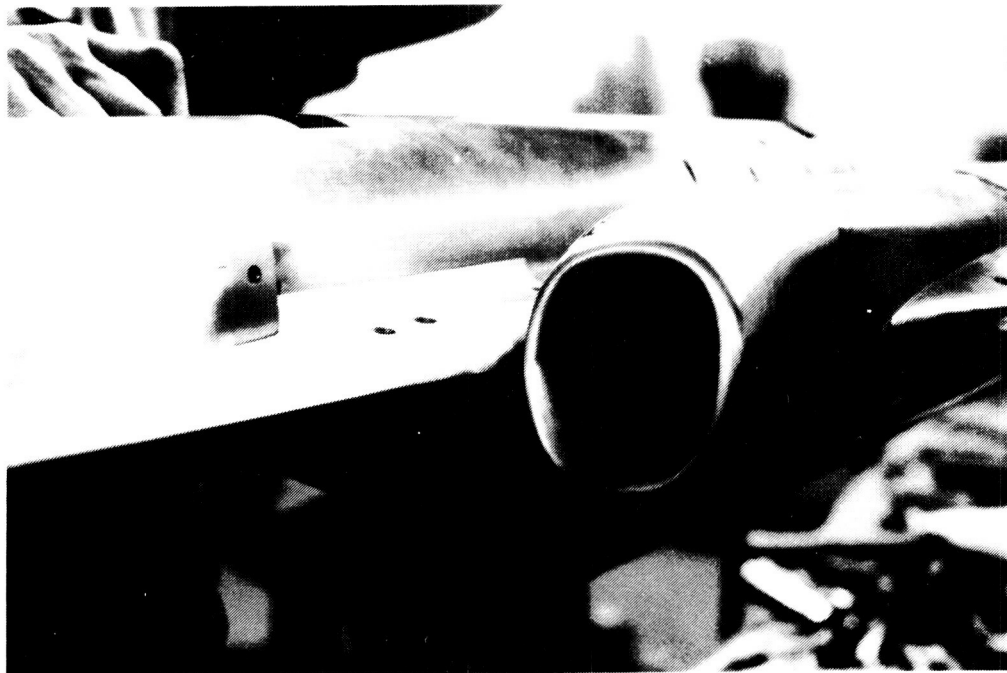
**Figure 2-15. Faired Inlet System on Test Vehicle**

A second flowing inlet system was also fabricated for use on the alternate aircraft configuration (see Figure 1-2). However, due to time constraints, it was never tested. This inlet was a circular design with a  $13^\circ$  reverse scarf angle, Figure 2-16.

The detailed design of these inlet systems is presented in Reference 7.

**2.2.2 Exhaust Systems** - The exhaust system was tested with both ALBENS and nozzle extension tubes. The ALBEN and nozzle extension systems were both non-metric to the internal aircraft balance. The metric break and common station for the airframe/exhaust system interface was at model station 50.689.





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**Figure 2-16. Untested Inlet for Alternate Configuration**

The ALBEN system was designed to model various power settings and thrust vectoring angles. The model configured with the ALBENS is shown in Figure 2-17. Two different power settings (dry and afterburning, (A/B)) were tested by interchanging the lower flap components, which change the throat and exit areas. Interchangeable upper flap components were used to configure the ALBENS for  $0^\circ$ ,  $20^\circ$ , or  $30^\circ$  of thrust vectoring (vector angle measured from horizontal, positive down).

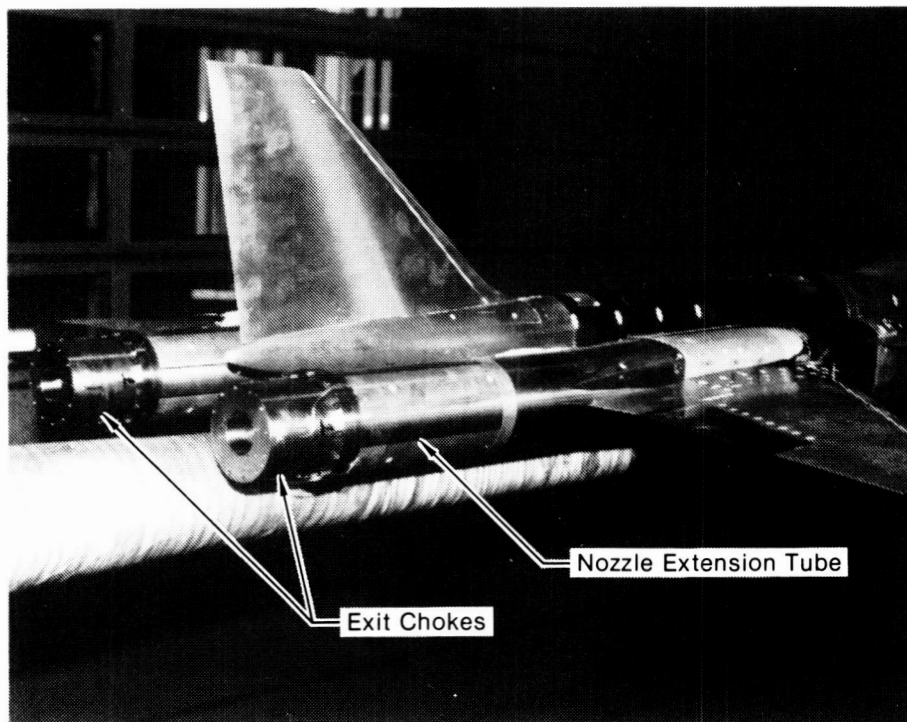
Nozzle extension assemblies replaced the ALBENS in order to isolate the flowing inlet effects from those associated with the exhaust plume. The extension tubes were sized such that the exhaust plume and base area effects would not be felt forward of the metric break. The nozzle extension installation is shown in Figure 2-18. Exit chokes were attached to the extension tubes to control inlet mass flow ratio (MFR). Four interchangeable chokes were used in the Flow-Through mode and sized to duplicate four MFRs within the operating range of the propulsion simulator.

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Figure 2-17. Unvectored A/B ALBEN System on Test Vehicle



GP53-0871-30-R

Figure 2-18. Nozzle Extension System on Test Vehicle

2.3 TEST CONFIGURATIONS - The four test configurations (Figure 2-3) were used to identify the presence of flowfield coupling and measure the net effect. These configurations were tested as summarized in Figure 2-19.

2.3.1 Common Baseline Configuration - The Common Baseline configuration is defined with faired inlets and the ALBEN exhaust system. This configuration, with unvectored A/B ALBENS in the jet-off condition, was tested in all three test modes to isolate any bias errors due to the separate tunnel entries.

The unvectored dry power ALBENS and vectored A/B ALBENS were also tested but only in the Jet-Effects mode. The A/B ALBEN system was tested at 0°, 20°, and 30° thrust vectoring. The 30° vectoring case was different from all other Jet-Effects configurations in that the wing flaps were also deflected 30°. This build-up, tested only at Mach 0.4, simulated the vehicle in a landing approach mode.

2.3.2 Nozzle Extension Configuration - The Nozzle Extension configuration is defined as having the flowing inlet system and the nozzle extension exhaust system. The inlet was tested with both the 0° and 45° cowl lip rotations. Most of the 45° lip cases were tested with the wing flaps deflected 30° as shown in Figure 2-20.

This configuration models the flowing inlet effects on the airframe independent of the exhaust effects.

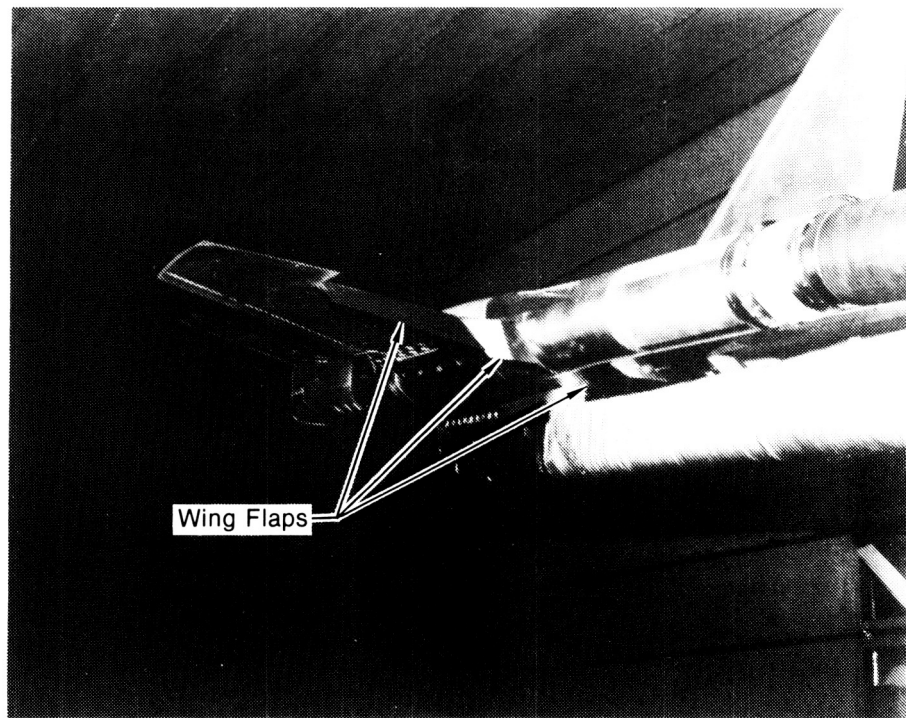
2.3.3 Nozzle Extension Baseline Configuration - The Nozzle Extension Baseline configuration is defined as having the faired inlet system and the nozzle extension exhaust system. In this configuration, only one canard angle was tested for each Mach number. The purpose of this build-up was to account for the nozzle extension effects on the airframe as compared to the ALBEN installation.

Configuration	Test Mode	Mach	MFR	NPR	$\alpha$ (deg)	$\delta_c$ (deg)
Common Baseline $\delta_N = 0^\circ$ $\delta_F = 0^\circ$ A/B ALBEN	F/T	0.4	N/A	1.0	-1 → 18	+5 → -15
		0.6				
		0.9				
		1.2			-1 → 10	+5 → -10
		1.4			-1 → 9	
	J/E	0.4	N/A	1.0 → 4.0	-1 → 18	+5 → -15
		0.6		1.0 → 6.0		-5
		0.9		1.0 → 8.5		-5
		1.2		1.0 → 11.0	-1 → 6	0
		1.4		1.0 → 14.0	-1 → 6	0
	CMAPS	0.4	N/A	1.0	-1 → 16	+5 → -15
		0.6				-5
		0.9				-5
		1.2			-1 → 6	0
		1.4				0
Common Baseline $\delta_N = 20^\circ$ $\delta_F = 0^\circ$ A/B ALBEN	J/E	0.4	N/A	1.0 → 4.0	-1 → 20	-5
		0.6		1.0 → 6.0	-1 → 22	-5
		0.9		1.0 → 8.0	-1 → 18	0 → -15
		1.2		1.0 → 12.0	-1 → 7	0
Common Baseline $\delta_N = 30^\circ$ $\delta_F = 0$ A/B ALBEN	J/E	0.4	N/A	1.0 → 4.0	-1 → 20	+5 → -5
Common Baseline $\delta_N = 0^\circ$ $\delta_F = 0^\circ$ Dry ALBEN	J/E	0.4	N/A	1.0 → 6.0	-1 → 9	0, -5
		0.6		1.0 → 6.0		-5
		0.9		1.0 → 6.0		0, -5
Nozzle Extension Baseline	F/T	0.4	N/A	1.0	-1 → 21	-5
		0.6				
		0.9				-5, -15
		1.2			-1 → 6	0
		1.4				
Nozzle Extension	F/T	0.4	0.5 → 1.2	N/A	-1 → 22	+5 → -15
		0.6	0.3 → 0.9			0 → -15
		0.9	0.3 → 0.9			0 → -15
		1.2	0.3 → 0.9		-1 → 6	0 → -10
		1.4	0.3 → 0.9			0 → -10
	CMAPS	0.4	0.5 → 1.2	N/A	-1 → 17	+5 → -15
		0.6	0.3 → 0.9			0 → -10
		0.9	0.3 → 0.9			0 → -10
		1.2	0.3 → 0.9		-1 → 7	0 → -10
		1.4	0.3 → 0.9			0 → -5
Simulated Aircraft	CMAPS	0.4	0.7 → 1.2	1.0 → 3.5	0 → 17	0 → -15
		0.6	0.3 → 0.9	1.0 → 4.0	0 → 17	0 → -10
		0.9	0.4 → 0.9	1.0 → 5.0	0 → 18	0 → -10
		1.2	0.3 → 0.8	1.0 → 7.5	0 → 6	0, -5
		1.4	0.3 → 0.8	1.0 → 9.5	0 → 7	0, -5

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Figure 2-19. Test Summary

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**Figure 2-20. Nozzle Extension Configuration With Wing Flaps Deflected 30°**

2.3.4 Simulated Aircraft Configuration - The Simulated Aircraft configuration is defined with flowing inlets and the ALBEN exhaust system. Only the flowing inlets with 0° lip rotation and the ALBENS in the afterburning (A/B) position with 0° thrust vectoring were tested in this configuration. This configuration closely models an aircraft in flight, with jet effects, inlet effects, and coupling effects measured simultaneously.

### 3. PRESSURE INSTRUMENTATION

The test vehicle was equipped with sufficient pressure instrumentation to assess the effects of model configuration and test technique differences. Static pressures were measured along the model external surface and total pressures at each compressor face.

3.1 EXTERNAL PRESSURE INSTRUMENTATION - The pressure distribution over the model surface was measured with 145 pressure taps located along the wings, nacelle, nozzle, and fuselage. The overall surface tap layout is presented in Figure 3-1. In addition, Appendix B lists each orifice number with the corresponding location coordinates. The pressure taps were arranged over the aircraft in five basic regions as follows: 1) Outer Wing, 2) Inner Wing, 3) Fuselage, 4) Nacelle, and 5) Nozzle.

3.1.1 Outer Wing - The wing surface outboard of the engine nacelle is defined as the outer wing. A total of 27 taps were located in this area. A row of 9 upper surface and 6 lower surface taps at B.L. 12.825 on the left wing measured the chordwise pressure distribution, Figure 3-2. The spanwise pressure distribution was measured with a total of 12 taps on the right wing at B.L. 16.031 and B.L. 19.237, Figure 3-3.

3.1.2 Inner Wing - The surface between the fuselage and nacelle is termed the inner wing. This region forms a region which may be sensitive to perturbations in flow due to MFR, NPR, or canard changes. A total of 13 taps were located on the upper and lower surfaces of the inner wing as shown in Figure 3-4.

3.1.3 Fuselage - The fuselage was instrumented along the centerline with a total of 9 pressure taps. These tap locations are shown in Figures 3-1 and 3-4.

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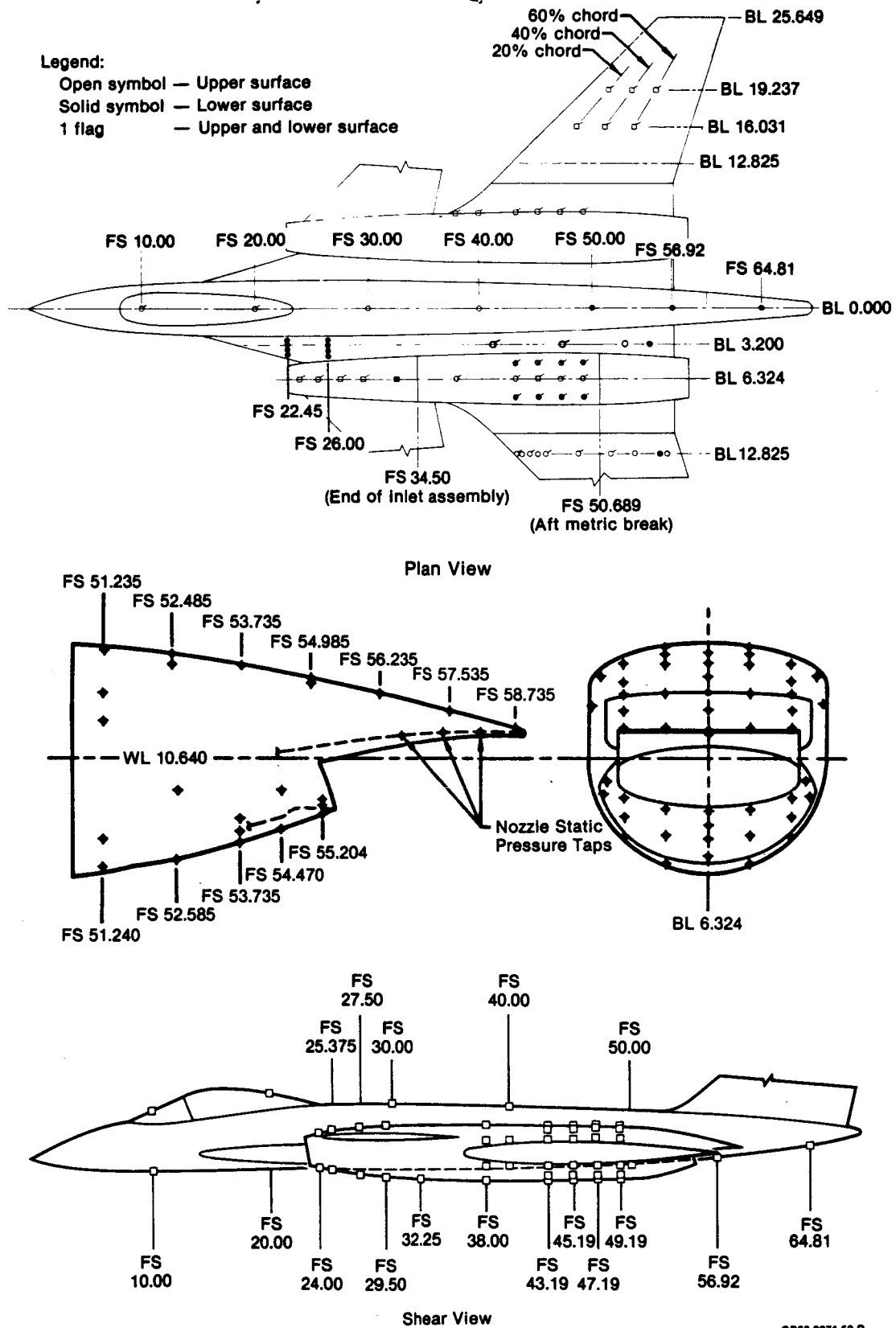
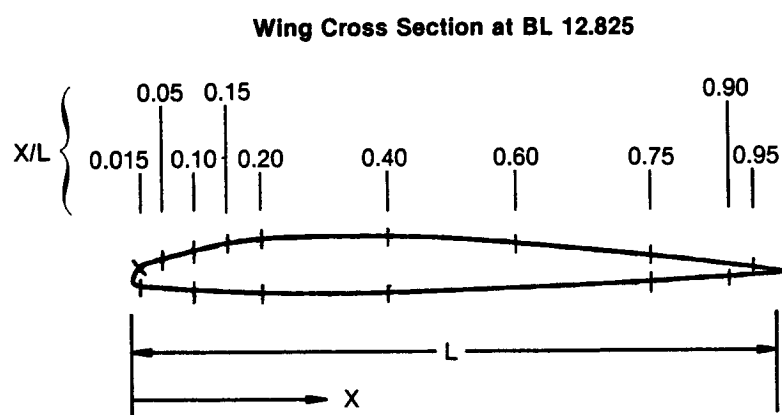
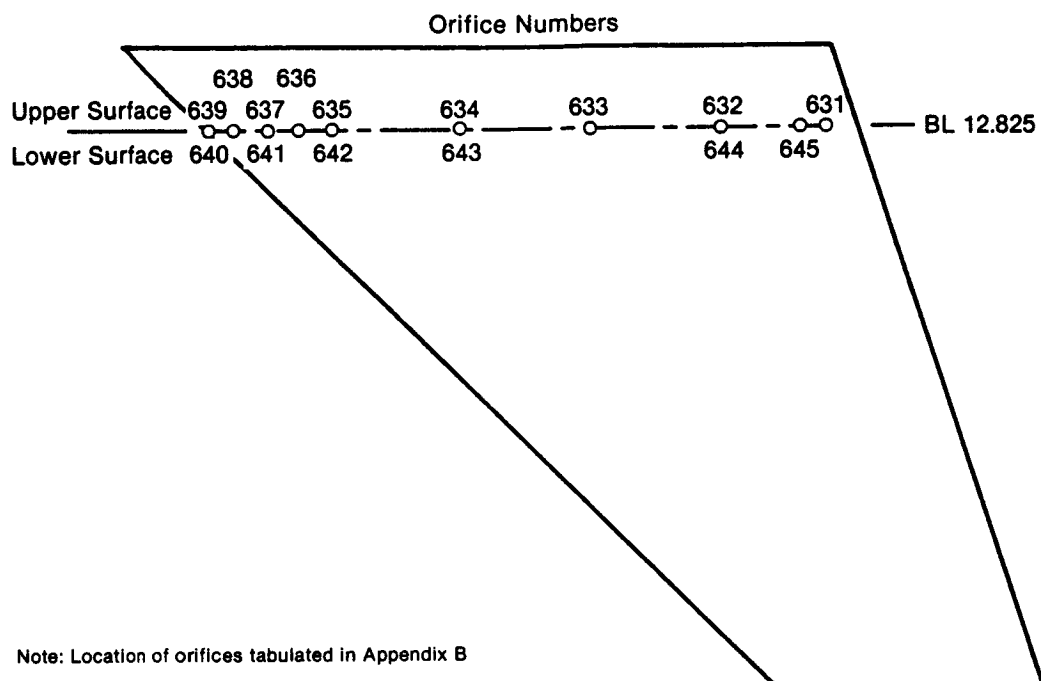


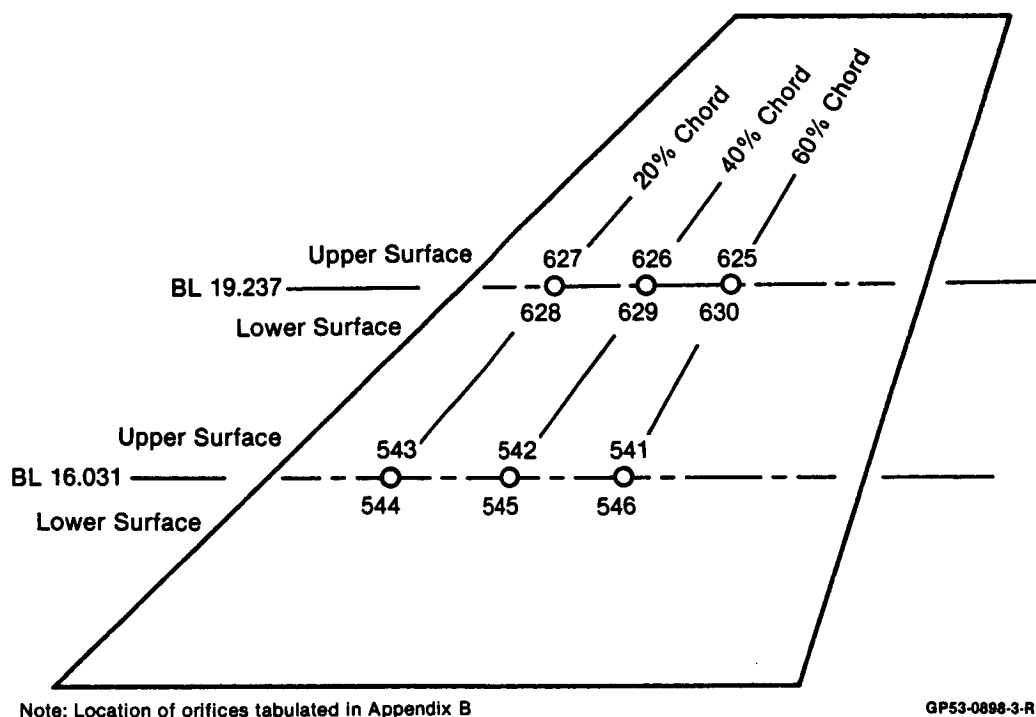
Figure 3-1. Location of Model External Pressure Instrumentation



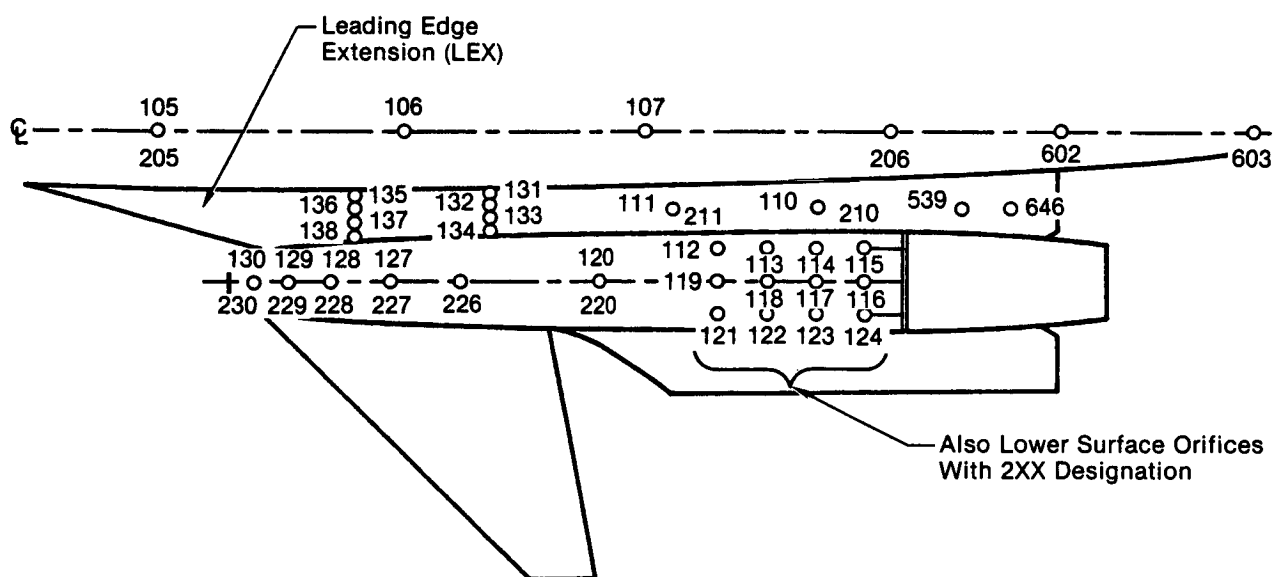
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**Figure 3-2. Outer Wing Pressure Instrumentation  
BL 12.825 on Left Wing**





**Figure 3-3. Outer Wing Pressure Instrumentation Right Wing**



**Figure 3-4. Center Fuselage, Inner Wing, and Nacelle Pressure Instrumentation**

3.1.4 Nacelle - The nacelle was instrumented with a total of 35 taps on the upper and lower surfaces. The layout of these taps is shown in Figure 3-4. A total of 12 taps were also located on the side of the right hand nacelle above and below the outer wing root, Figure 3-5.

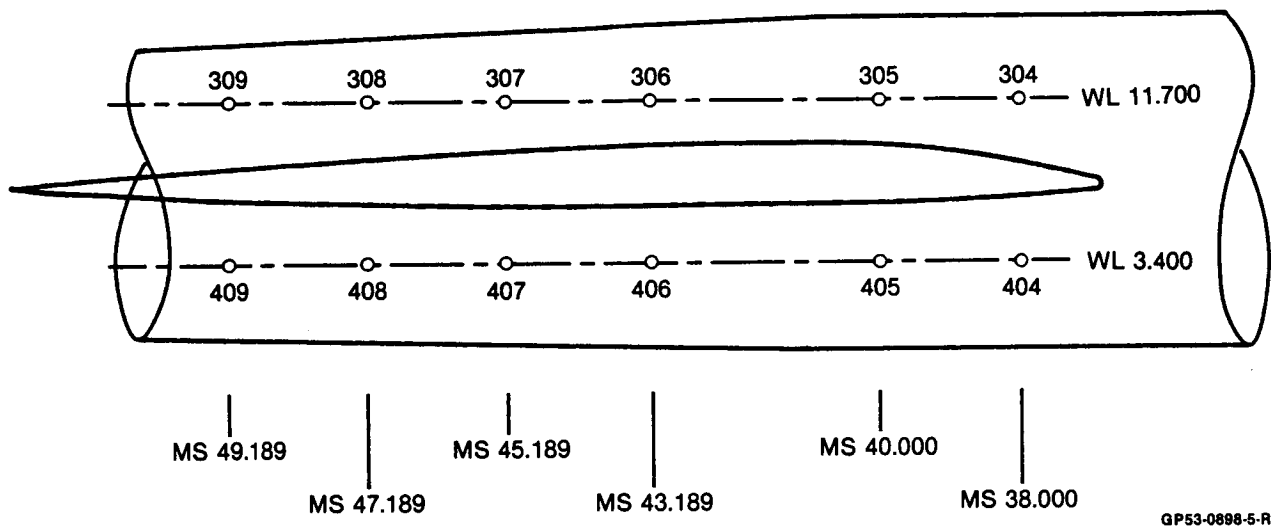
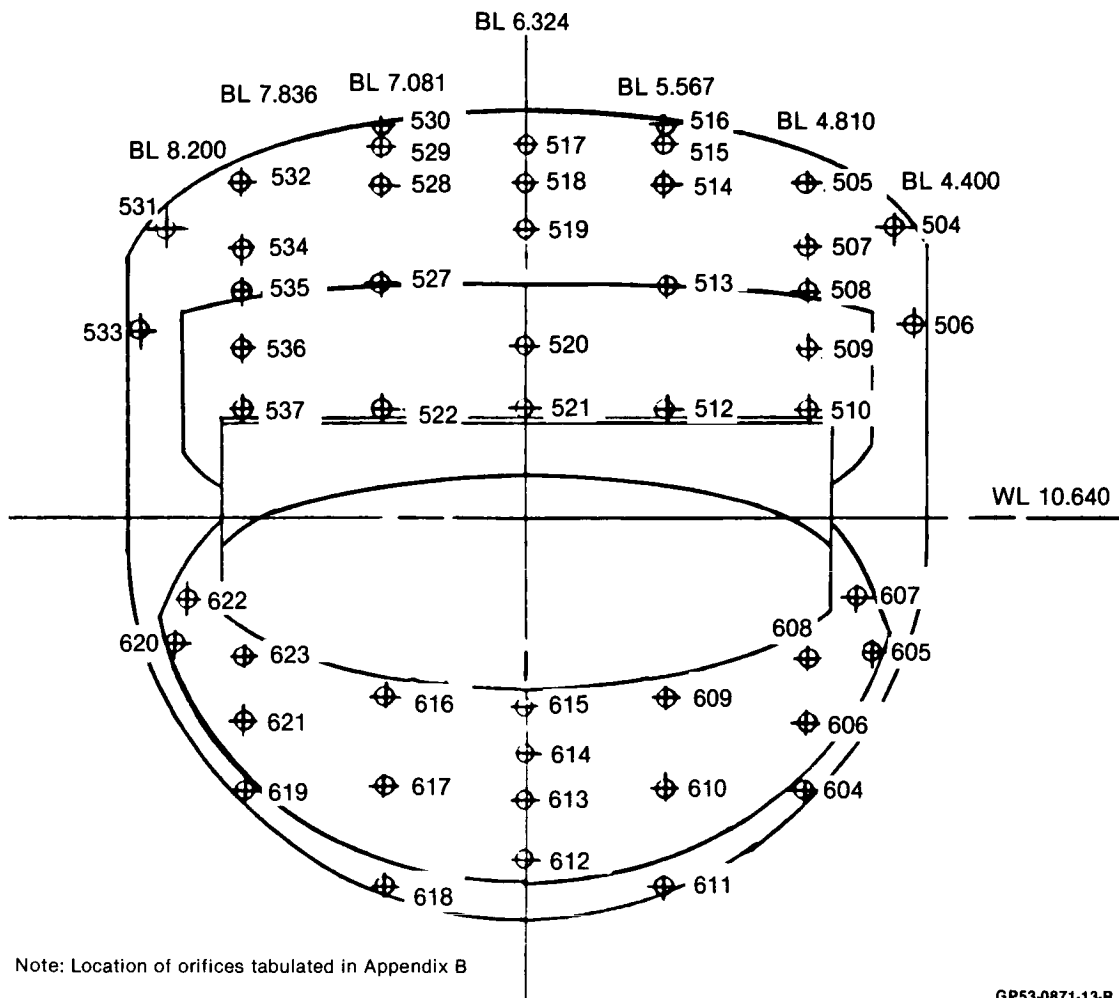


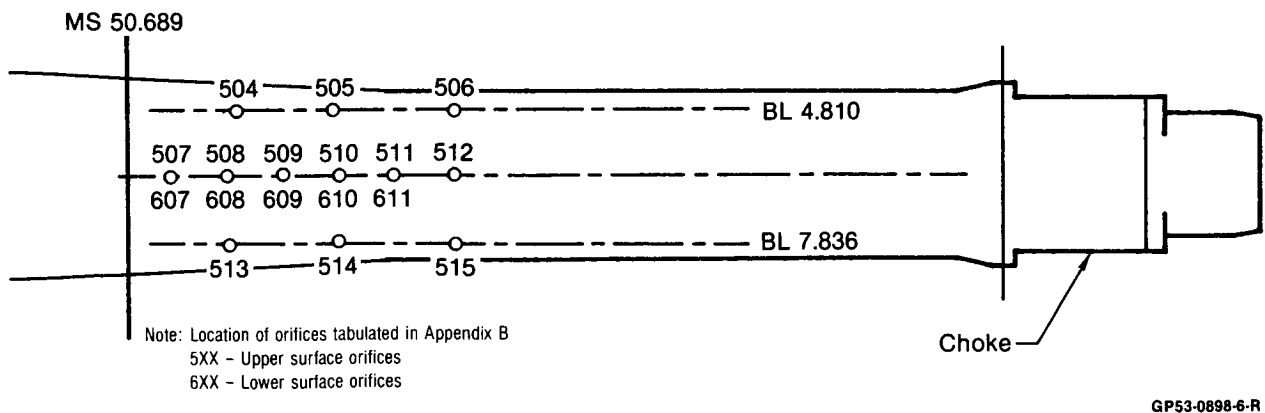
Figure 3-5. Right Hand Nacelle Side Pressure Instrumentation

3.1.5 Nozzle - The non-metric ALBEN exhaust system was instrumented with 49 surface taps. The tap layout across the ALBEN is shown in Figure 3-6. This large number of taps was used to perform a pressure-area integration from which the lift, drag, and pitching moment on the nozzles were calculated.

The nozzle extensions were instrumented with 17 surface taps. The tap layout for the nozzle extensions is shown in Figure 3-7.

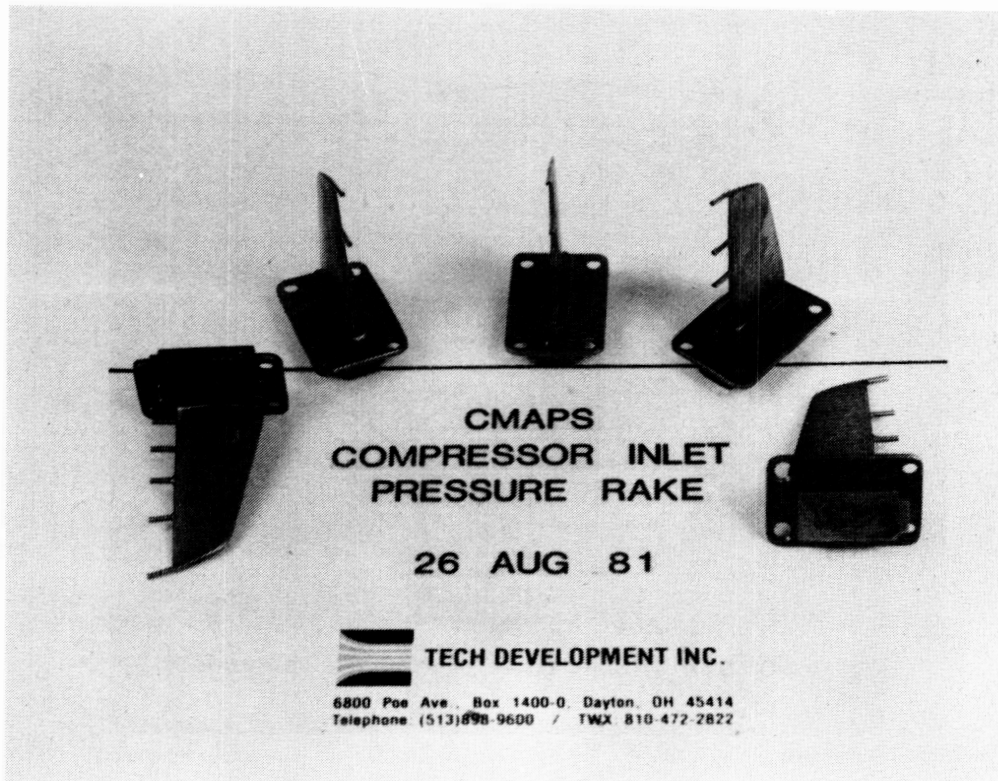


**Figure 3-6. ALBEN External Pressure Instrumentation**



**Figure 3-7. Nozzle Extension Tube External Pressure Instrumentation**

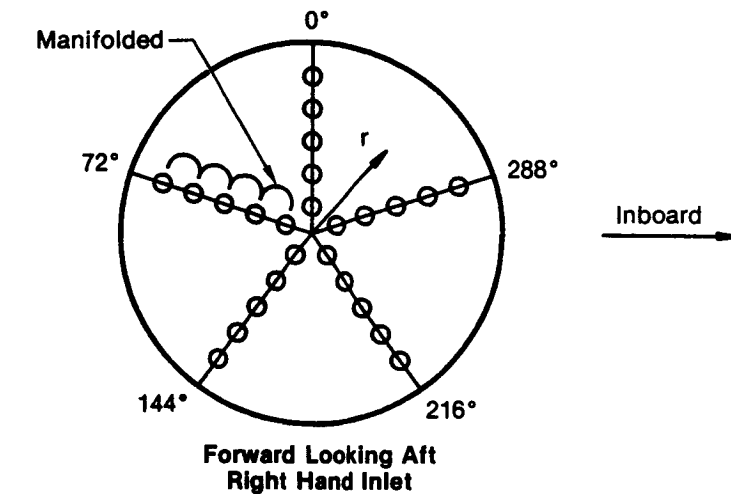
3.2 COMPRESSOR FACE PRESSURE INSTRUMENTATION - The total pressure at the compressor face was measured to calculate inlet airflow, recovery and distortion. Each engine face was instrumented with a five leg rake with each leg containing five total pressure probes. A photo of the rake legs is shown in Figure 3-8.



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Figure 3-8. Compressor Face Total Pressure Rake

On the right hand compressor face rake, the probes on the upper, outboard leg were manifolded together, with the single measurement recorded on a Scanivalve. This single measurement was required as an input to the CMAPS control console. The remaining 20 probes and 4 wall statics were independently measured on Scanivalves. The layout of the right hand rake is shown in Figure 3-9.

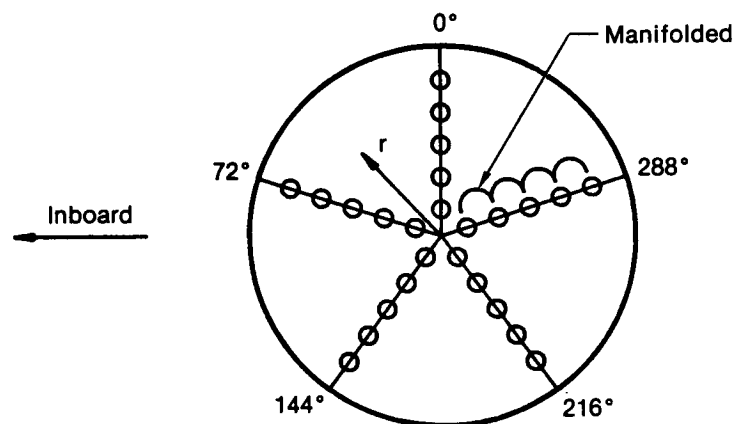


Radial Location		Leg 1	Leg 2	Leg 3	Leg 4	Leg 5
(cm)	(In.)	0°	72°	144°	216°	288°
1.275	(0.502)	320	Manifolded	325	330	335
2.121	(0.835)	321	to	326	331	336
2.713	(1.068)	322	345	327	332	337
3.198	(1.259)	323	↓	328	333	338
3.620	(1.425)	324		329	334	339
Wall Statics		312		314	315	316

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**Figure 3-9. Right Hand Compressor Face Rake Layout**

On the left hand compressor face rake, the probes on the upper, outboard leg were also manifolded together for the reason mentioned above. Each pressure along one other leg was measured as shown in Figure 3-10. The remaining 15 probes were on dummy rakes, so the pressures were not measured at these locations. It was not necessary to fully instrument both sides, since the model was tested with symmetric MFRs and no sideslip.



Forward Looking Aft  
Left Hand Inlet

Radial Location		Leg 1	Leg 2	Leg 3	Leg 4	Leg 5
(cm)	(In.)	0°	72°	144°	216°	288°
1.275	(0.502)	Not Measured		433	Not Measured	Manifolded to 438
2.121	(0.835)			434		
2.713	(1.068)			435		
3.198	(1.259)			436		
3.620	(1.425)			437		
Wall Statics		412		413		

GP53-0898-8-R

Figure 3-10. Left Hand Compressor Face Rake Layout

#### 4. REFERENCES

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2. Zilz, D. E., Wallace, H. W., and Hiley, P. E., "Propulsion and Airframe Aerodynamic Interactions of Supersonic V/STOL Configurations - Volume III: Wind Tunnel Test Data Analysis Report", NASA CR-177343, September 1985.
3. Eigenmann, M. F. and Devereaux, P. A., "Compact Multi-Mission Propulsion Simulator Development", AFWAL-TR-82-2040, September 1982.
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5. Hiley, P. E., Wallace, H. W., Booher, M. E. and Reinsberg, J. G., "Advanced Nozzle Concepts Program Volume III - Nozzle Integration for Air Superiority Fighter Application", AFWAL-TR-81-3165, Volume III, January 1982.
6. Mraz, M. R. and Hiley, P. E., "Propulsion and Airframe Aerodynamic Interactions of Supersonic V/STOL Configurations: Phase I - Final Report", NASA CR-177369, September 1985.
7. Booher, M. E., "Propulsion and Airframe Aerodynamic Interactions of Supersonic V/STOL Configurations: Phase II - Final Report", NASA CR-177370, September 1985.
8. Zilz, D. E., Wallace, H. W., and Hiley, P. E., "Propulsion and Airframe Aerodynamic Interactions of Supersonic V/STOL Configurations - Volume IV: Final Report - Summary", NASA CR-177343, September 1985.

APPENDIX A  
WIND TUNNEL TEST RESULTS: PRESSURE DATA

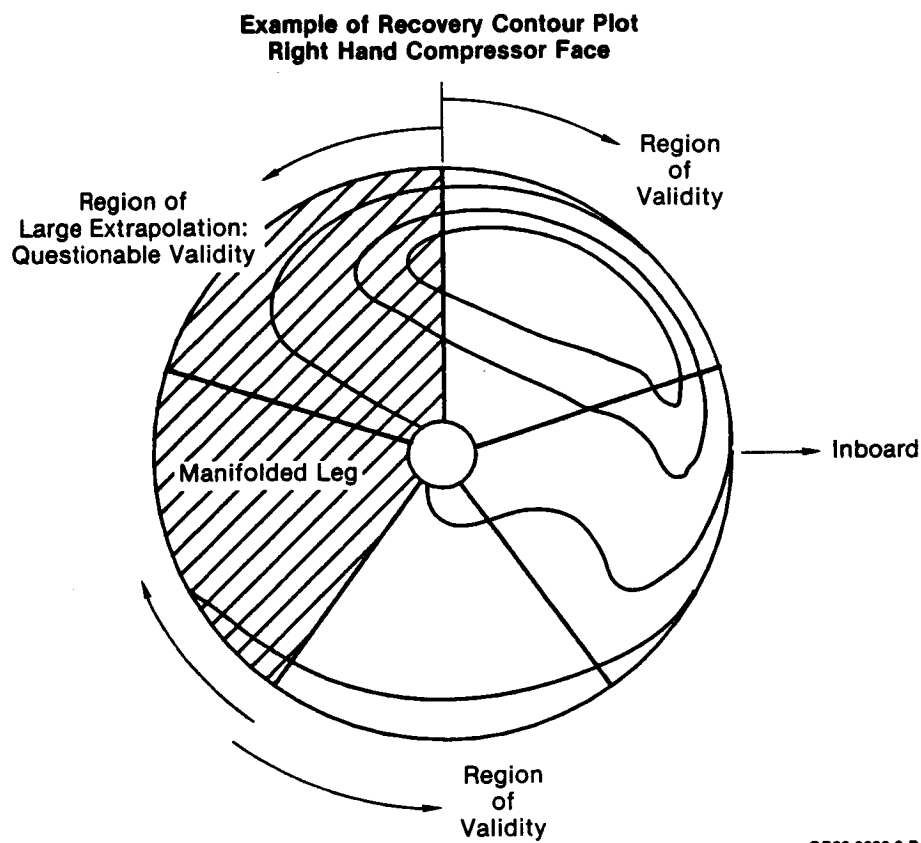
The basic static pressure data is presented graphically as pressure coefficient ( $C_p$ ) distributions across the airframe. Six key regions on the airframe have been chosen to summarize the pressure data for a given test condition.

The inlet total pressure data is presented as recovery distributions at the engine face. This data will also be used to present inlet recovery and distortion characteristics.

It must be noted that there is a significant region on the compressor face contour plots which may be invalid due to a lack of instrumentation. Since the upper, outboard leg of the total pressure rake was manifolded to a single Scanivalve port (see Figure 3-9), the local recovery distribution was not obtained for this sector of the compressor face. The contours plotted in this sector, as shown in Figure A-1, should therefore be disregarded or used with caution due to the excessive extrapolation required to construct them. To illustrate that no data was taken in this region, the manifolded leg is not shown on the contour plots.

It is also noted that a source of bias error was identified which may impact the interpretation of some of the pressure data taken in the Flow-Through mode. This error is attributed to a change in the Scanivalve transducer calibration procedure. The Scanivalves were calibrated to a positive pressure differential during the Flow-Through mode testing and to a negative pressure differential during the Jet-Effects and CMAPS modes. A non-linearity in the pressure transducer is thought to have created an error, identified during comparisons of the Common Baseline configuration for the three test modes. The Flow-Through mode data was generally 0.01 to 0.05 in  $C_p$  lower than the other two modes. Therefore, the Flow-Through mode data should not be compared directly to either of the other two modes. However,





**Figure A-1. Region of Validity for Compressor Face  
Recovery Distributions**

Common Baseline comparisons between the Jet-Effects mode data and CMAPS mode data fall within an acceptable error band, so direct comparisons of any data between these two modes is considered valid. Likewise, comparisons "within" the Flow-Through mode should be valid.

STATIC PRESSURE DISTRIBUTIONS - The surface pressure distributions are grouped to show the effects of various inlet, nozzle and control surface configurations. Each figure consists of six plots corresponding to the six key regions on the airframe. The plots and the regions are as follows (also see Figure 3-1):

- A Nacelle Centerline Upper Surface
- B Nacelle Centerline Lower Surface
- C Wing BL 12.825 Upper Surface

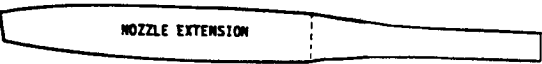

- D Wing BL 12.825 Lower Surface
- E Inner Wing BL 3.2 Upper Surface
- F Inner Wing BL 3.2 Lower Surface

The test mode and test configuration are designated on each plot under the "Description" label as follows:



### Test Mode, Test Configuration

Following is an index of the surface pressure distribution figures.


### Inlet Mass Flow Ratio Effects

Configuration	Test Mode	Mach	NPR	$\delta_c$	$\alpha$	Pages
 COWL LIP = 0° $\delta_F = 0^\circ$	F/T	0.4	N/A	-5°	0°	41-46
		0.6	↓	↓	↓	47-52
		0.9	↓	↓	↓	53-58
		1.2	↓	↓	↓	59-64
		1.4	↓	↓	↓	65-70
COWL LIP = 45° $\delta_F = 30^\circ$	F/T	0.4	N/A	0°	0°	71-76
	CMAPS	0.4	N/A	0°	0°	77-82
		0.6	↓	↓	↓	83-88
		0.9	↓	↓	↓	89-94
		1.2	↓	↓	↓	95-100
COWL LIP = 0° $\delta_F = 0^\circ$		1.4	↓	↓	↓	101-106
 ALBEN A/B $\delta_N = 0^\circ$	CMAPS	0.4	1.3	0°	0°	107-112
		0.6	1.4	-5°		113-118
		0.9	2.0	-5°		119-124
		1.2	-	-5°		125-130
		1.4	-	0°	↓	131-136
		0.6	2.3	-5°	5°	137-142
			2.2	-5°	9°	143-148
			2.0	-5°	17°	149-154

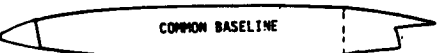
### Nozzle Pressure Ratio Effects

Configuration	Test Mode	Mach	MFR	$\delta_c$	$\alpha$	Pages
 <p>COMMON BASELINE</p> <p>ALBEN DRY</p> <p><math>\delta_N = 0^\circ</math></p>	J/E	0.4	N/A	$-5^\circ$	$0^\circ$	155-160
		0.6	↓	↓	↓	161-166
		0.9		↓	↓	167-172
<p>ALBEN A/B</p> <p><math>\delta_N = 0^\circ</math></p>	J/E	0.4	N/A	$-5^\circ$	$0^\circ$	173-178
		0.6	↓	$-5^\circ$	↓	179-184
		0.9		$-5^\circ$	↓	185-190
		1.2		$0^\circ$	↓	191-196
		1.4		$0^\circ$	↓	197-202
 <p>STIMULATED AIRCRAFT</p> <p>ALBEN A/B</p> <p><math>\delta_N = 0^\circ</math></p>	CMAPS	0.4	1.15	$0^\circ$	$0^\circ$	203-208
		0.6	0.92	$-5^\circ$	↓	209-214
		0.9	0.75	$-5^\circ$	↓	215-220
		1.2	0.69	$0^\circ$	↓	221-226
		1.4	0.72	$0^\circ$	↓	227-232
		0.6	0.90	$-5^\circ$	$5^\circ$	233-238
		0.6	0.85	$-5^\circ$	$9^\circ$	239-244
		0.6	0.75	$-5^\circ$	$17^\circ$	245-250

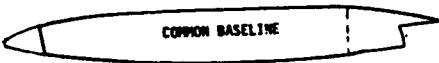
### NPR Effects With Thrust Vectoring

Configuration	Test Mode	Mach	MFR	$\delta_c$	$\alpha$	Pages
 <p>COMMON BASELINE</p> <p>ALBEN A/B</p> <p><math>\delta_N = 20^\circ</math></p>	J/E	0.4	N/A	$-5^\circ$	$0^\circ$	251-256
		0.6	↓	$-5^\circ$	↓	257-262
		0.9		$-5^\circ$	↓	263-268
		1.2		$0^\circ$	↓	269-274
<p>ALBEN A/B</p> <p><math>\delta_N = 30^\circ \quad \delta_F = 30^\circ</math></p>	J/E	0.4	N/A	$-5^\circ$	$0^\circ$	275-280

### Nozzle Vectoring Effects




Configuration	Test Mode	Mach	NPR	$\delta_c$	$\alpha$	Pages
 <p>COMMON BASELINE</p> <p><math>\delta_N = 0^\circ</math> - vs - <math>\delta_N = 20^\circ</math></p>	J/E	0.4	4.1	$-5^\circ$	$0^\circ$	281-286
		0.6	4.2	↓	↓	287-292
		0.9	6.2	$-5^\circ$	$0^\circ$	293-298
		0.9	6.2	$-5^\circ$	$9.6^\circ$	299-304
		1.2	6.5	$0^\circ$	$0^\circ$	305-310
		0.4	1.0	$-5^\circ$	$0^\circ$	311-316
		0.6	1.0	$-5^\circ$	$0^\circ$	317-322
		0.9	1.0	$-5^\circ$	$0^\circ$	323-328
		1.2	1.0	$0^\circ$	$0^\circ$	329-334
<p><math>\delta_N = 0^\circ</math> - vs - <math>\delta_N = 30^\circ</math></p> <p><math>\delta_F = 0^\circ \quad \delta_F = 30^\circ</math></p>	J/E	0.4	4.1	$-5^\circ$	$0^\circ$	335-340
		0.4	1.0	$-5^\circ$	$0^\circ$	341-346

### Power Setting Effects

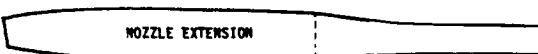
Configuration	Test Mode	Mach	NPR	$\delta c$	$\alpha$	Pages
 COMMON BASELINE	J/E	0.4	4.2	-5°	0°	347-352
		0.6	4.2	-5°	↓	353-358
		0.9	6.7	-5°		359-364

Dry-vs-A/B


### Canard Rotation Effects

Configuration	Test Mode	Mach	MFR	NPR	$\alpha$	Pages
 NOZZLE EXTENSION COWL LIP = 0° $\delta_F = 0^\circ$	F/T	0.4	1.20	N/A	0°	365-370
		0.6	0.92	↓	0°	371-376
		0.9	0.87		0°	377-382
		1.2	0.89		0°	383-388
		1.4	0.93		0°	389-394
 COMMON BASELINE ALBEN A/B $\delta_N = 0^\circ$	F/T	0.4	N/A	1.0	0°	395-400
		0.6	↓	↓	0°	401-406
		0.9			0°	407-412
		1.2			↓	413-418
		1.4			↓	419-424
 SIMULATED AIRCRAFT ALBEN A/B $\delta_N = 0^\circ$	CMAPS	0.4	1.15	2.8	0°	425-430
		0.6	0.92	3.8	0°	431-436
		0.9	0.75	4.4	0°	437-442
		1.2	0.75	7.6	0°	443-448
		1.4	0.71	7.8	0°	449-454
		0.6	0.90	4.0	5°	455-460
		0.6	0.84	3.9	9°	461-466
		0.6	0.74	3.5	18°	467-472

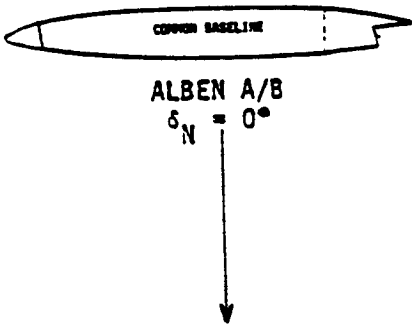

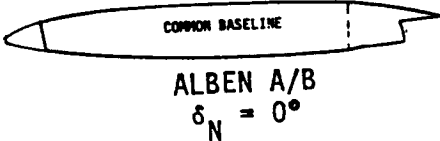
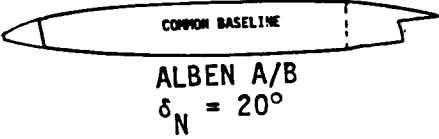
### Wing Flap and Cowl Lip Deflection Effects

Configuration	Test Mode	Mach	MFR	NPR	$\alpha$	Pages
 NOZZLE EXTENSION	F/T	0.4	1.11	N/A	0°	473-478

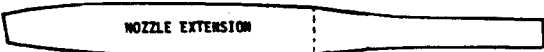

### Angle of Attack Effects

Configuration	Test Mode	Mach	MFR	NPR	$\delta c$	Pages
 COMMON BASELINE ALBEN A/B $\delta_N = 0^\circ$	F/T	0.4	N/A	1.0	-5°	479-484
		0.6	↓	↓	-5°	485-490
		0.9			-5°	491-496
		1.2			0°	497-502
		1.4			0°	503-508



# Angle of Attack Effects (Continued)

Configuration	Test Mode	Mach	MFR	NPR	$\delta_c$	Pages
 <p>COMMON BASELINE</p> <p>ALBEN A/B</p> <p><math>\delta_N = 0^\circ</math></p>	J/E	0.4	N/A	1.0	$-5^\circ$	509-514
		0.6	↓	↓	$-5^\circ$	515-520
		0.9	↓	↓	$-5^\circ$	521-526
		1.2	↓	↓	$0^\circ$	527-532
		1.4	↓	↓	$0^\circ$	533-538
	CMAPS	0.4	N/A	1.0	$-5^\circ$	539-544
		0.6	↓	↓	$-5^\circ$	545-550
		0.9	↓	↓	$-5^\circ$	551-556
		1.2	↓	↓	$0^\circ$	557-562
		1.4	↓	↓	$0^\circ$	563-568
 <p>NOZZLE EXTENSION BASELINE</p>	F/T	0.4	N/A	N/A	$-5^\circ$	569-574
		0.6	↓	↓	$-5^\circ$	575-580
		0.9	↓	↓	$-5^\circ$	581-586
		1.2	↓	↓	$0^\circ$	587-592
		1.4	↓	↓	$0^\circ$	593-598
 <p>COMMON BASELINE</p> <p>ALBEN A/B</p> <p><math>\delta_N = 0^\circ</math></p>	J/E	0.4	N/A	4.0	$-5^\circ$	599-604
		0.6	↓	4.2	$-5^\circ$	605-510
		0.9	↓	6.0	$-5^\circ$	611-616
		1.2	↓	9.0	$0^\circ$	617-622
		1.4	↓	10.3	$0^\circ$	623-628
	CMAPS	0.4	1.10	3.3	$0^\circ$	629-634
		0.6	0.90	3.8	$-5^\circ$	635-640
		0.9	0.75	5.3	$-5^\circ$	641-646
		1.2	0.75	7.5	$0^\circ$	647-652
		1.4	0.80	9.6	$0^\circ$	653-658
 <p>COMMON BASELINE</p> <p>ALBEN A/B</p> <p><math>\delta_N = 20^\circ</math></p>	J/E	0.4	N/A	4.0	$-5^\circ$	659-664
		0.6	↓	4.2	$-5^\circ$	665-670
		0.9	↓	6.1	$-5^\circ$	671-676
		1.2	↓	8.9	$0^\circ$	677-682
<p>ALBEN A/B</p> <p><math>\delta_N = 30^\circ \quad \delta_F = 30^\circ</math></p>	J/E	0.4	N/A	4.0	$0^\circ$	683-688
<p>ALBEN DRY</p> <p><math>\delta_N = 0^\circ</math></p>	J/E	0.4	N/A	6.9	$-5^\circ$	689-694
		0.6	↓	4.7	$-5^\circ$	695-700
		0.9	↓	6.8	$-5^\circ$	701-706

### Angle of Attack Effects (Continued)

Configuration	Test Mode	Mach	MFR	NPR	$\delta_c$	Pages
 COWL LIP = 0° $\delta_F = 0^\circ$	F/T	0.4	1.21	N/A	-5°	707-712
		0.6	0.92	↓	-5°	713-718
		0.9	0.87		-5°	719-724
		1.2	0.89		0°	725-730
		1.4	0.93		0°	731-736
COWL LIP = 45° $\delta_F = 30^\circ$	F/T	0.4	1.11	N/A	0°	737-742
COWL LIP = 45° $\delta_F = 0^\circ$	F/T	0.6	0.85	↓	-5°	743-748
		0.9	0.85			749-754
 COWL LIP = 0° $\delta_F = 0^\circ$	CMAPS	0.4	1.18	N/A	0°	755-760
		0.6	0.92	↓	0°	761-766
		0.9	0.87		0°	767-772
		1.2	0.89		0°	773-778
		1.4	0.95		0°	779-784

### Nozzle Extension Effects


Configuration	Test Mode	Mach	MFR	NPR	$\delta_c$	Pages
 — vs — 	F/T	0.4	N/A	N/A	-5°	785-790
		0.6	↓	↓	-5°	791-796
		0.9			-5°	797-802
		1.2			0°	803-808
		1.4			0°	809-814

COMPRESSOR FACE TOTAL PRESSURE CHARACTERISTICS - The compressor face total pressure characteristics are presented in terms of distortion, recovery and local recovery contour distributions.

### Angle of Attack and Mass Flow Ratio Effects

Each figure in this section consists of the following plots:


- A Distortion and Recovery Variations
- B Recovery Contour @ Low Angle of Attack
- C Recovery Contour @ High Angle of Attack

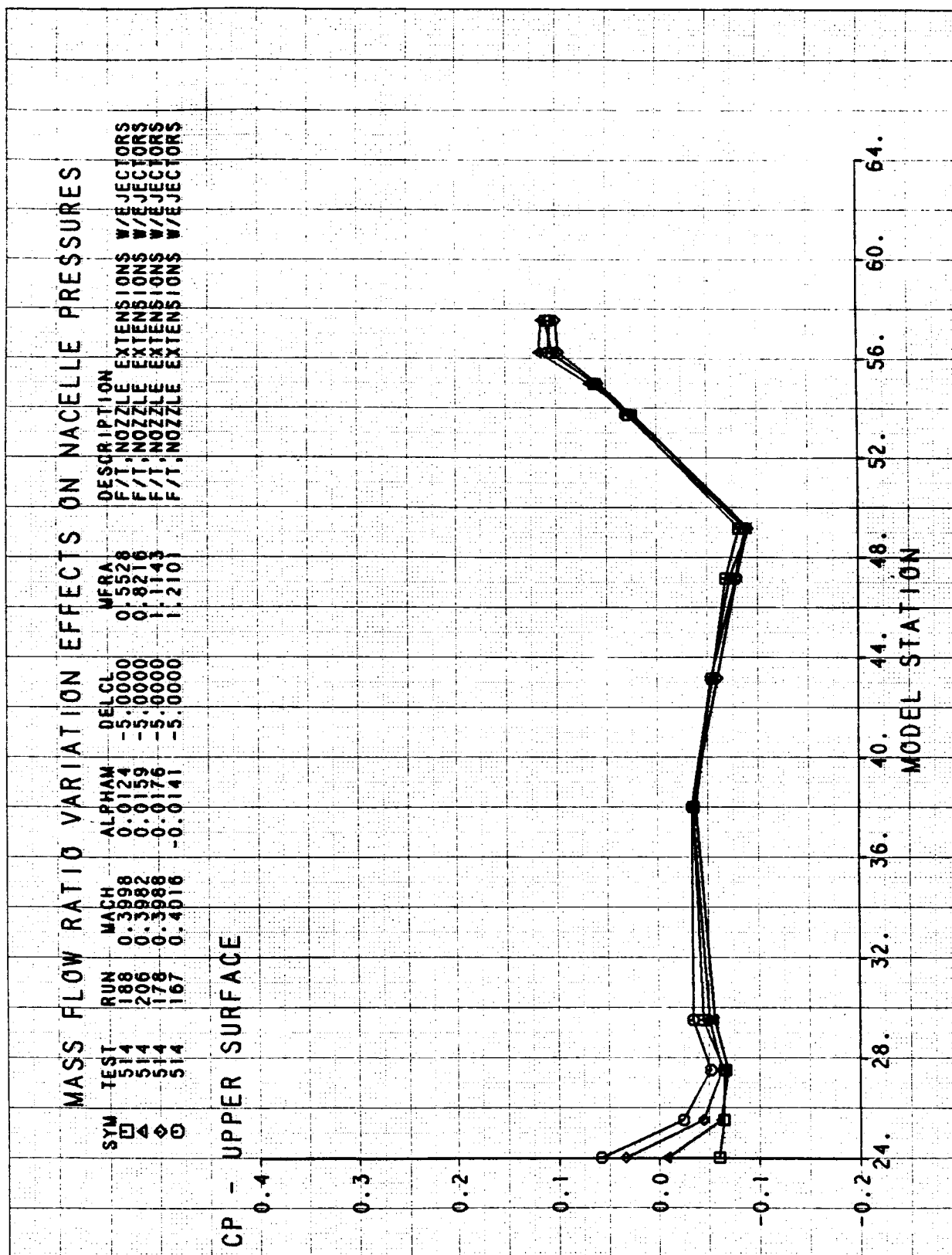
Configuration	Test Mode	Mach	$\delta_c$	Pages
 COWL LIP = 0° $\delta_F = 0^\circ$	F/T	0.4	-5°	815-817
		0.6	-5°	818-820
		0.9	-5°	821-823
		1.2	0°	824-826
		1.4	0°	827-829

### Inlet Droop Lip Effects

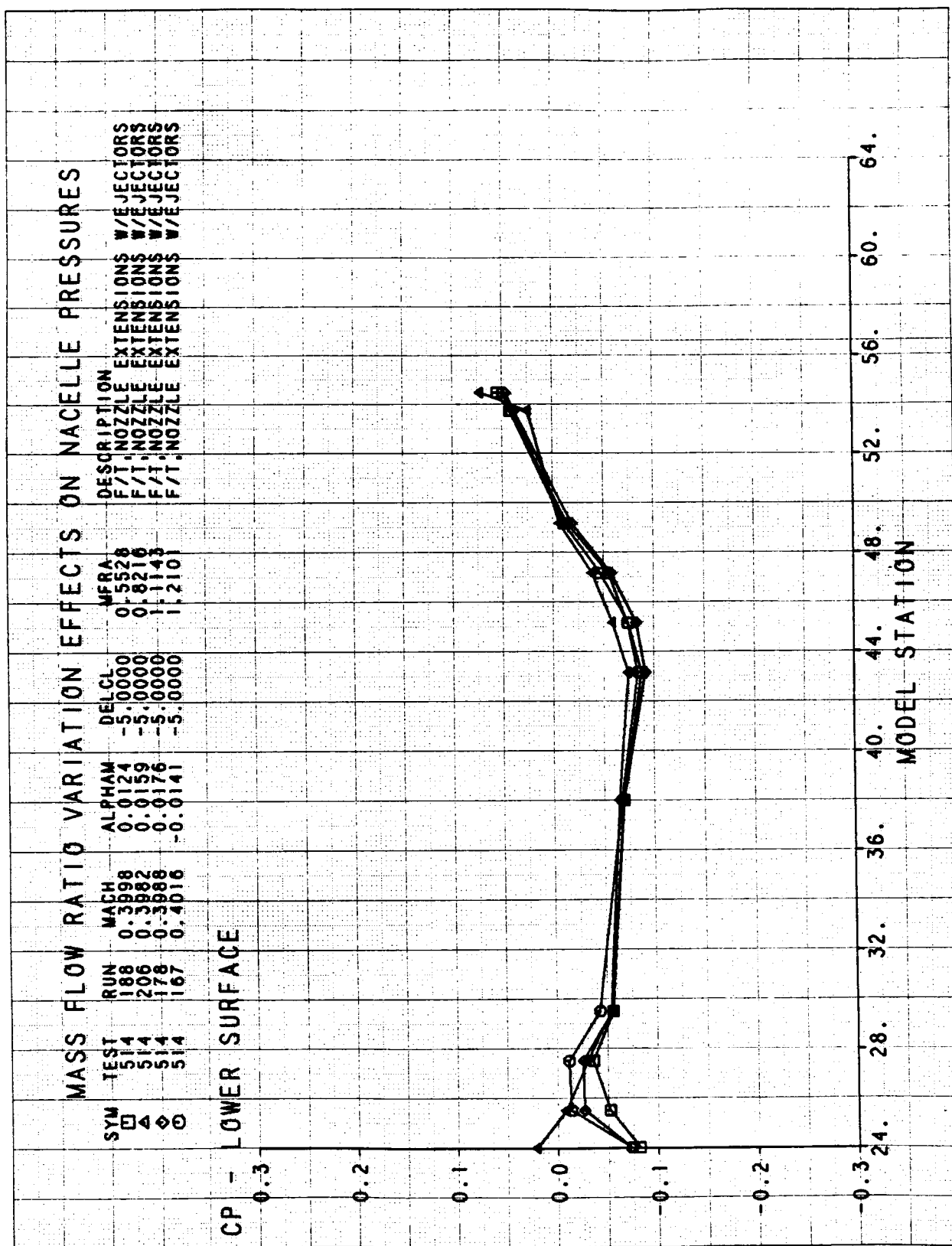
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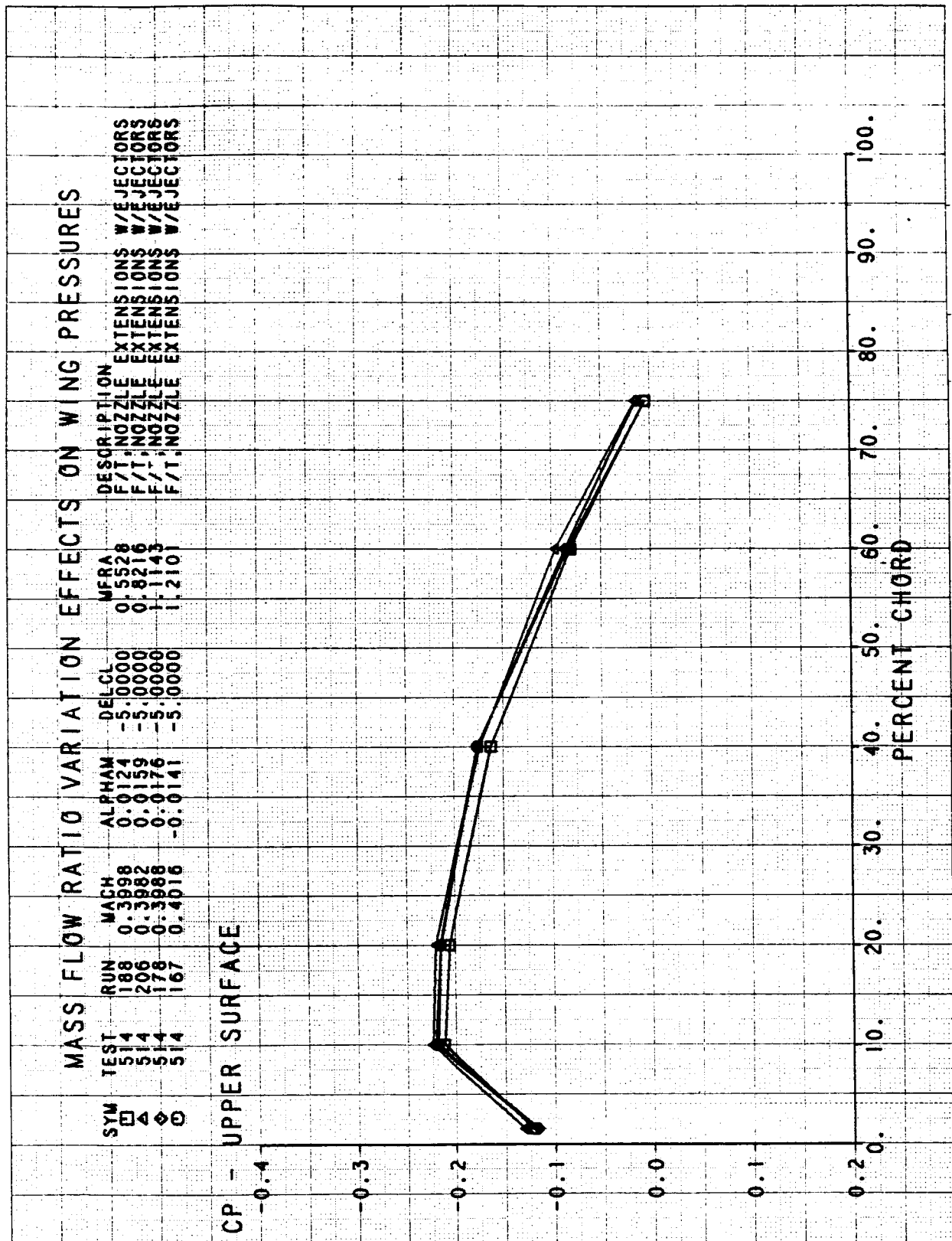
- A Distortion and Recovery Variations for 0° Lip and 45° Lip Rotations
- B Recovery Contour @ Low Angle of Attack and 0° Lip Rotation
- C Recovery Contour @ Low Angle of Attack and 45° Lip Rotation
- D Recovery Contour @ High Angle of Attack and 0° Lip Rotation
- E Recovery Contour @ High Angle of Attack and 45° Lip Rotation

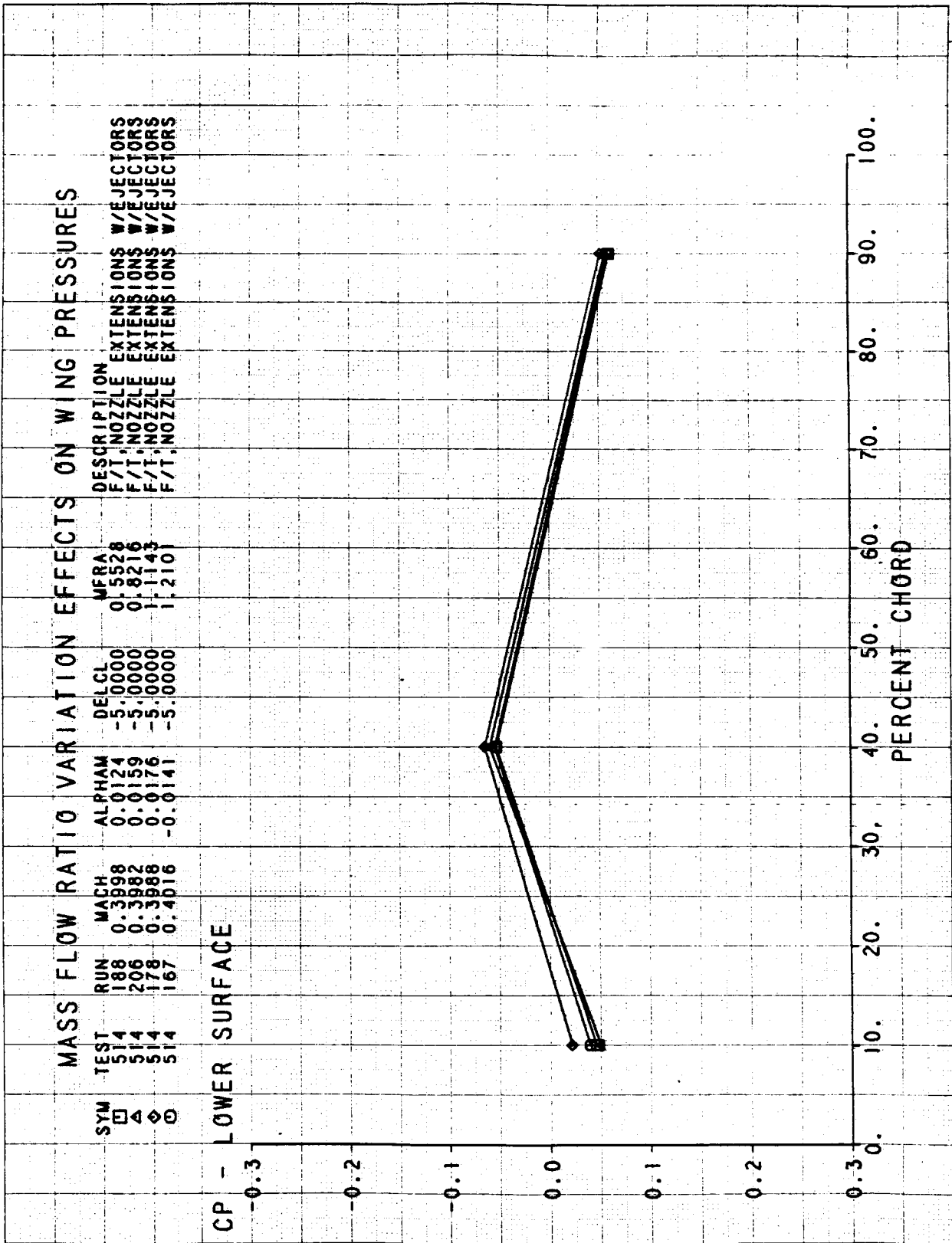
Configuration	Test Mode	Mach	MFR	$\delta_c$	Pages
 COWL LIP = 0°      NOZZLE EXTENSION	F/T	0.4	0.6	0°	830-834
		0.4	0.8	0°	835-839
		0.4	1.1	0°	840-844
		0.6	0.9	-5°	845-849
		0.9	0.9	-5°	850-854



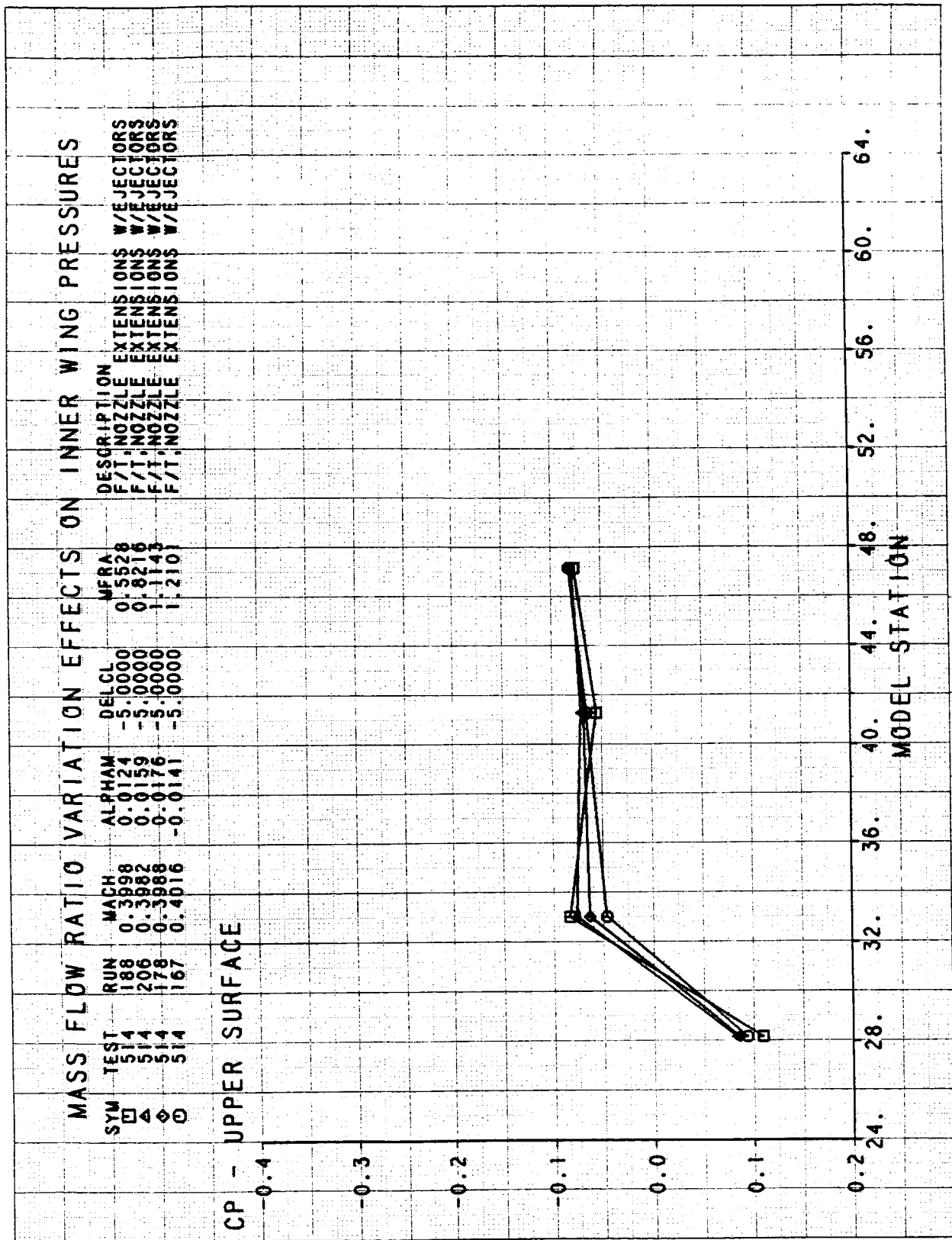


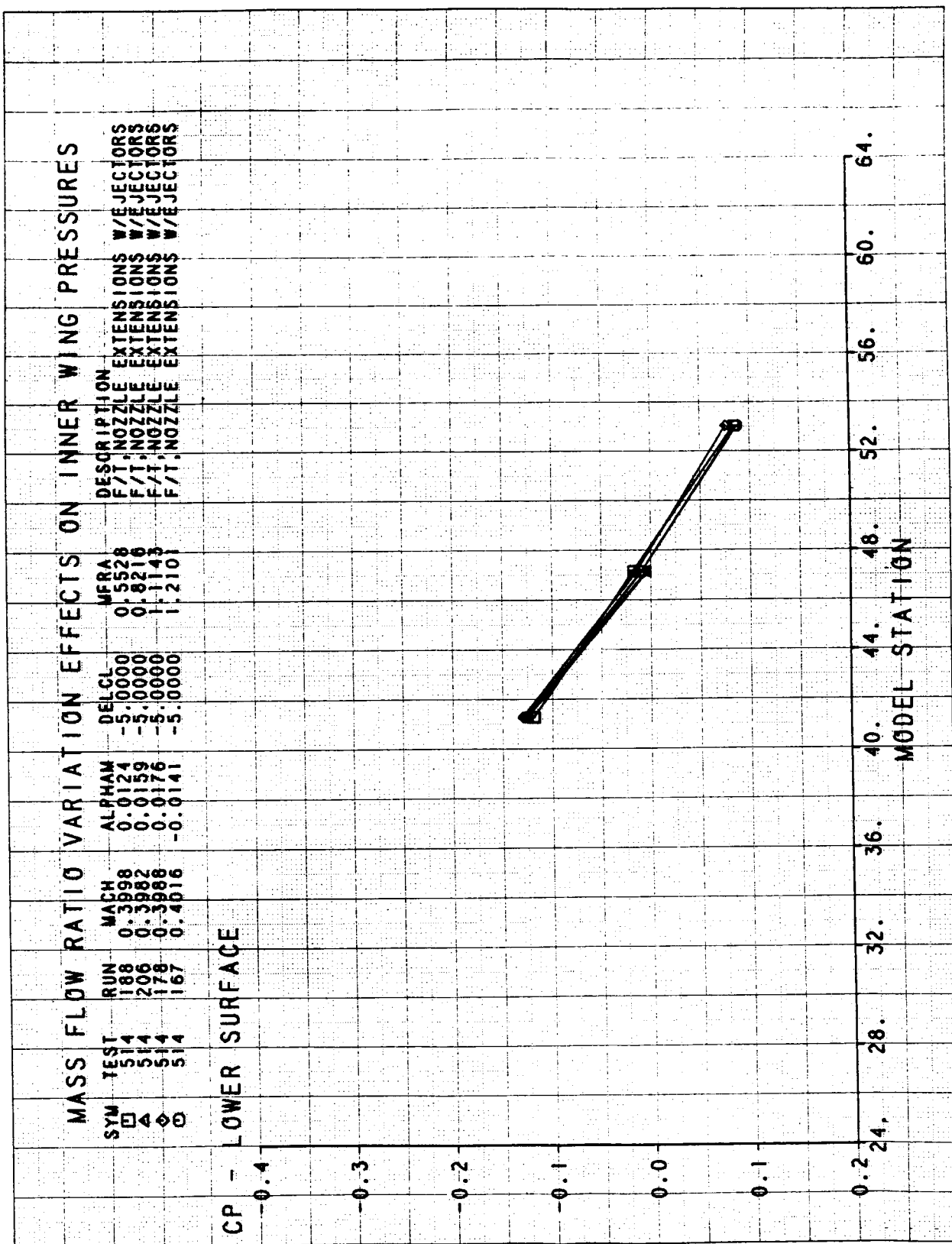


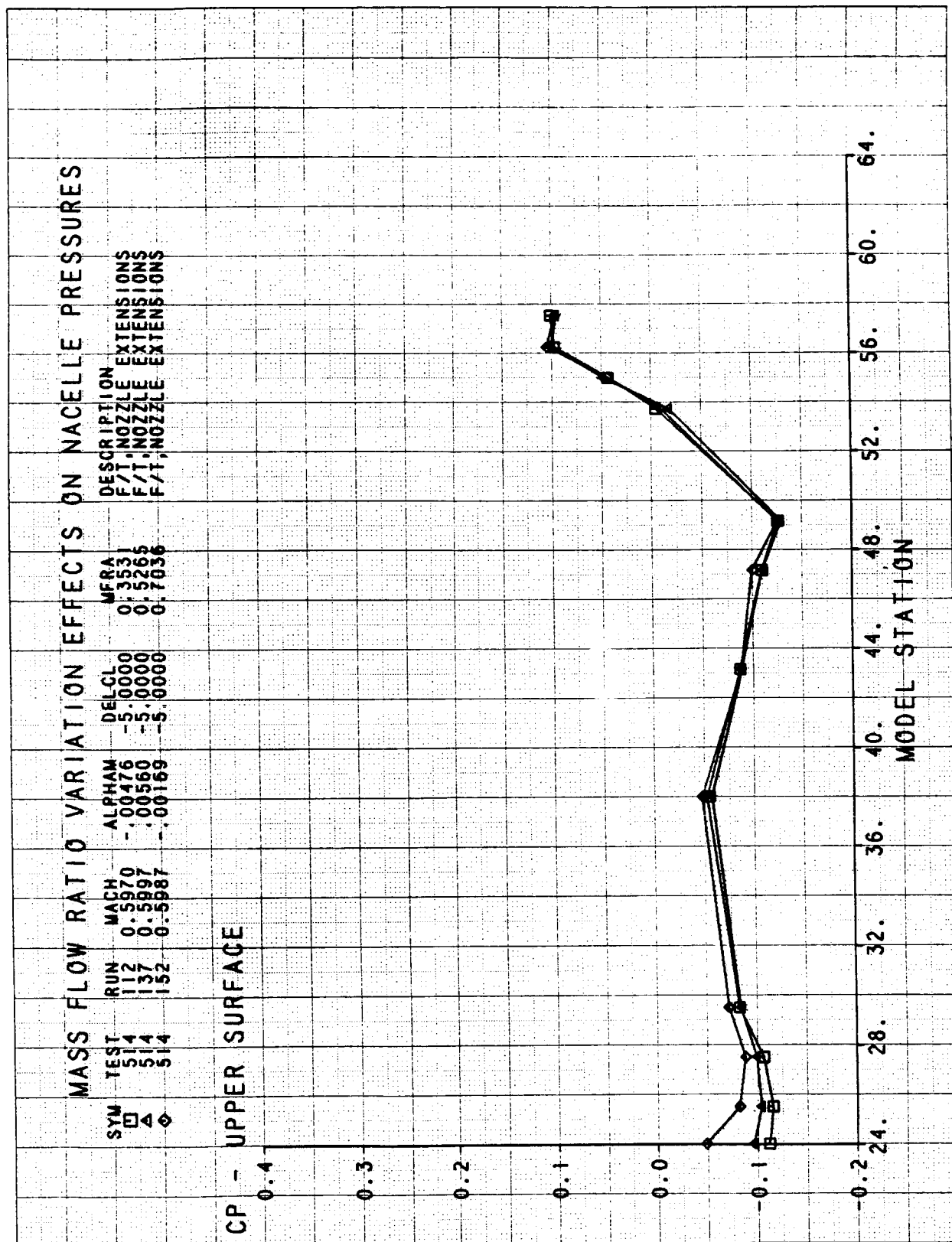


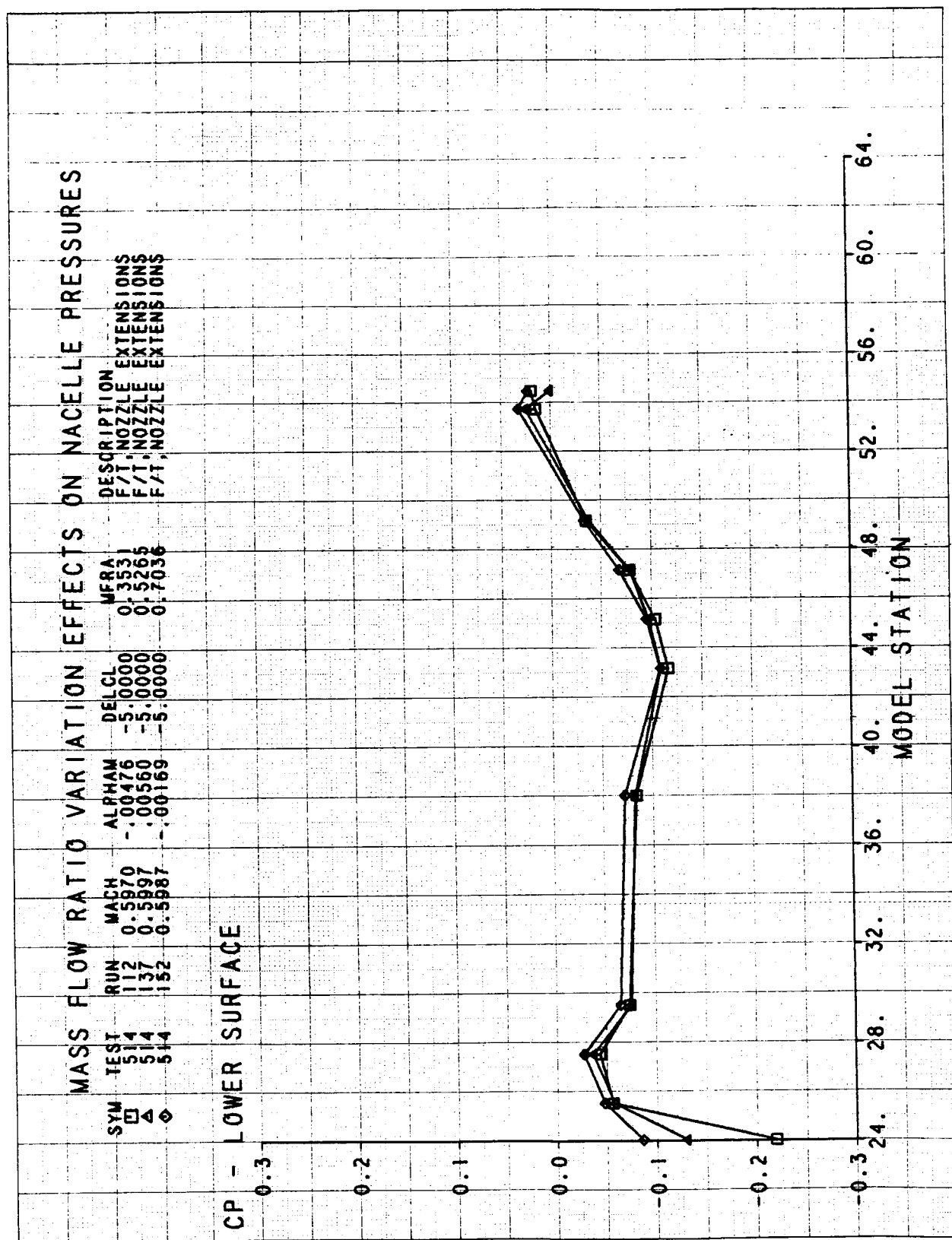


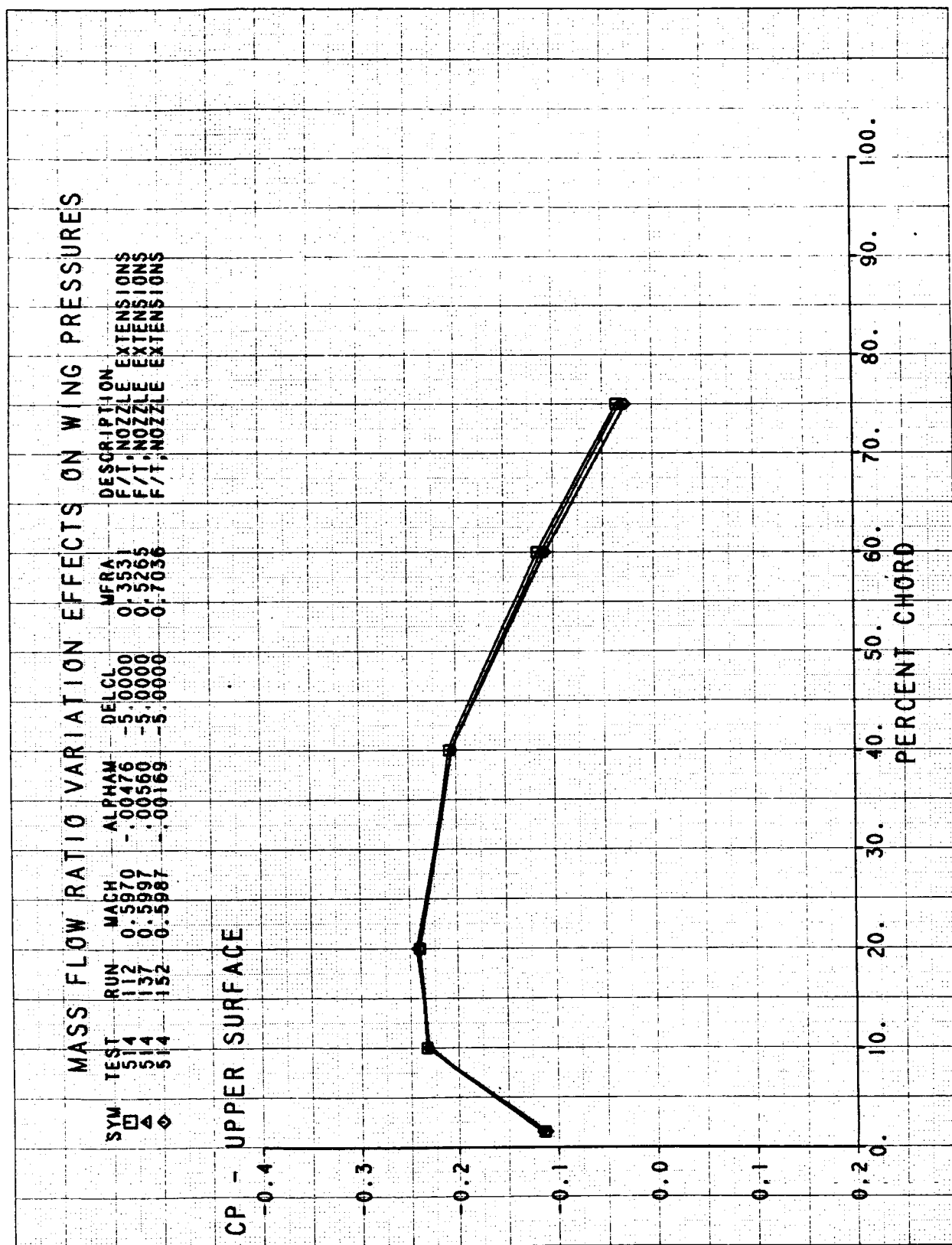
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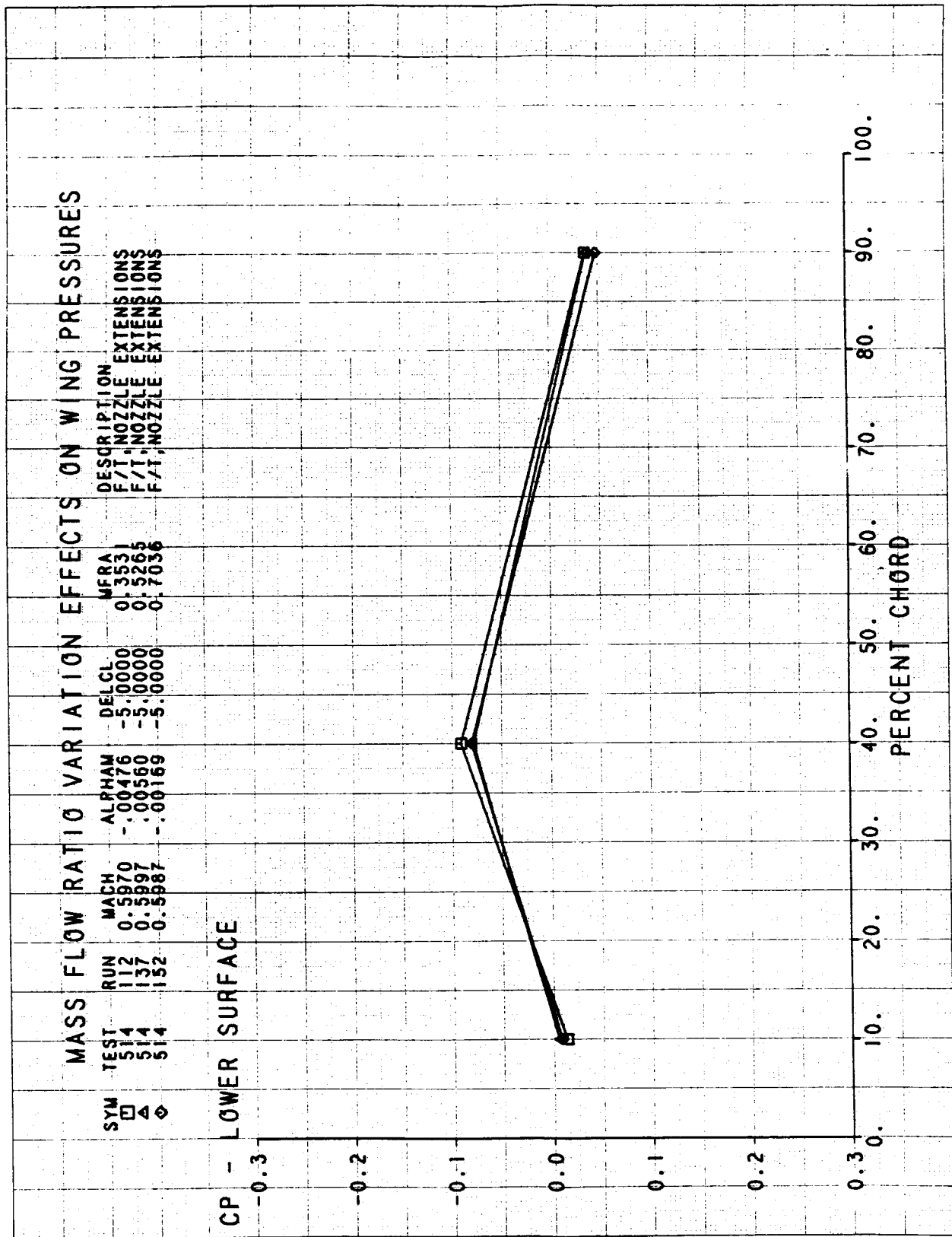


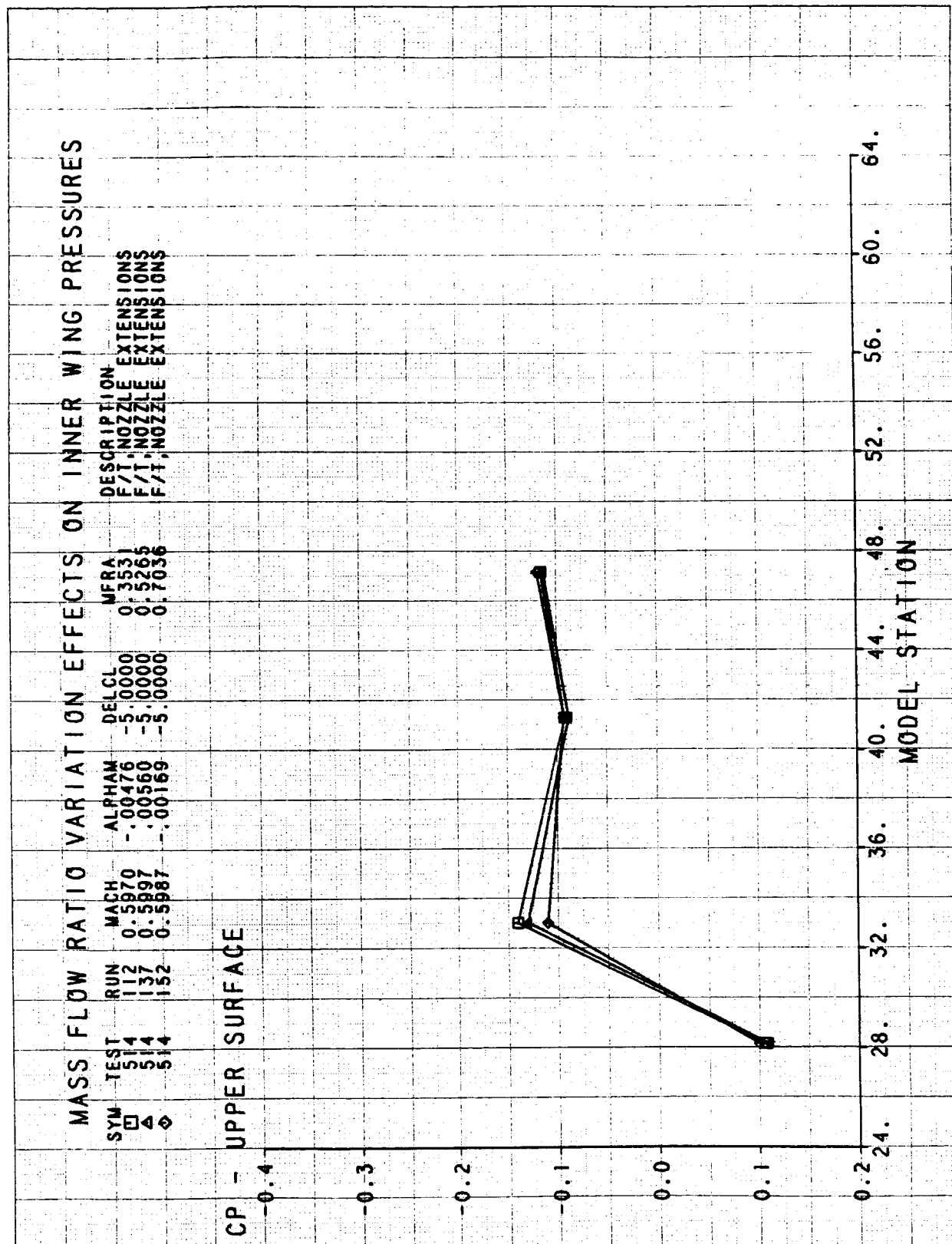


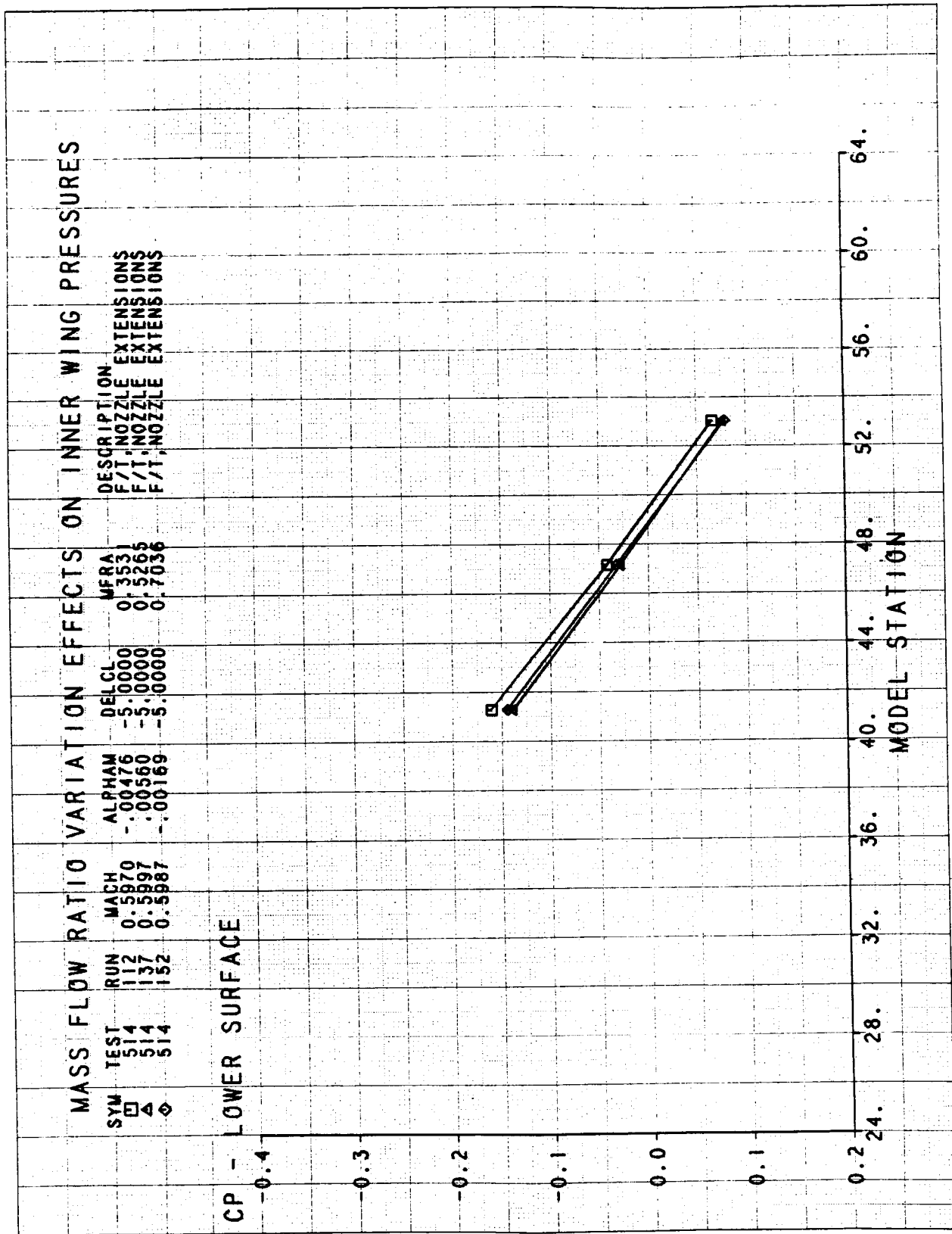


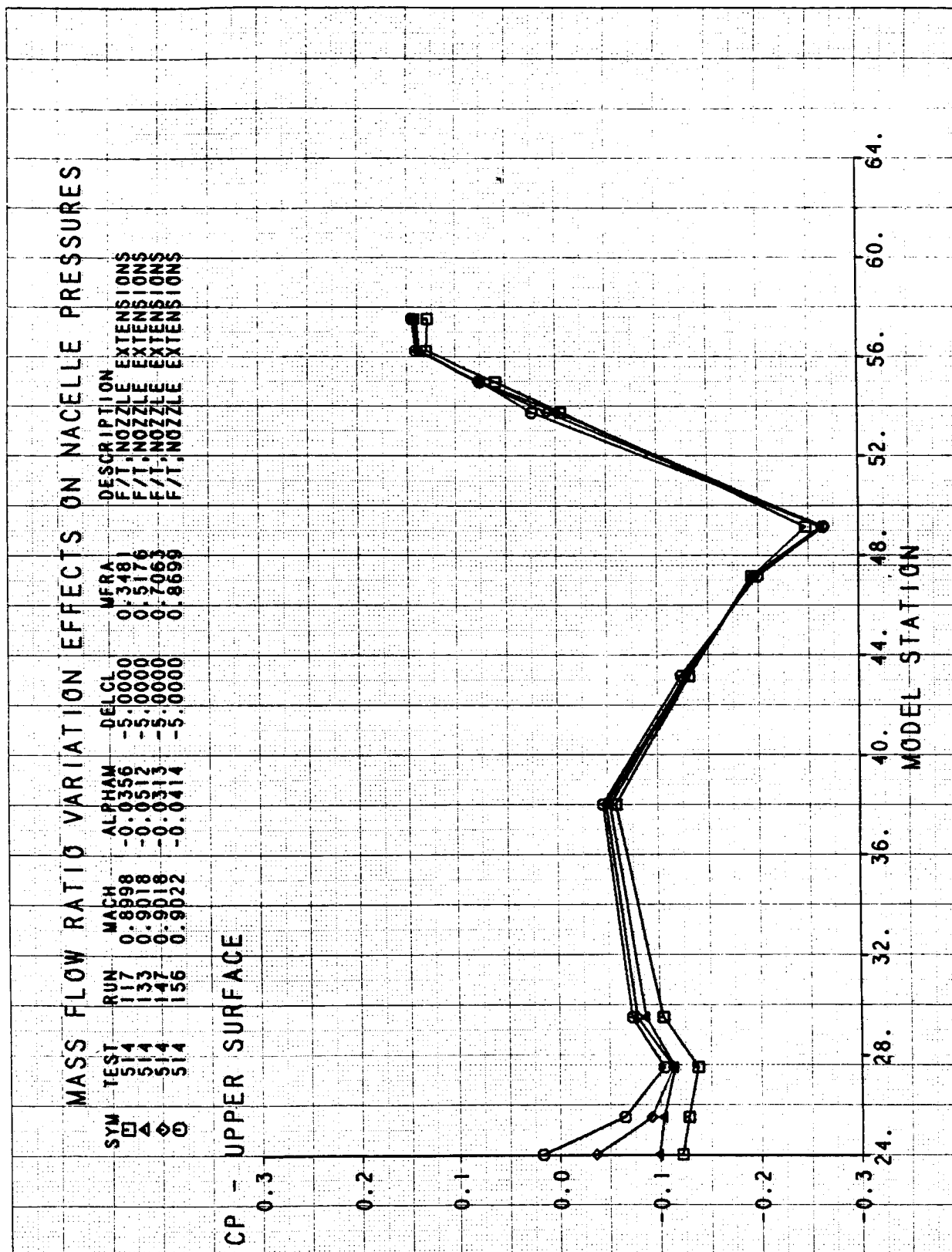


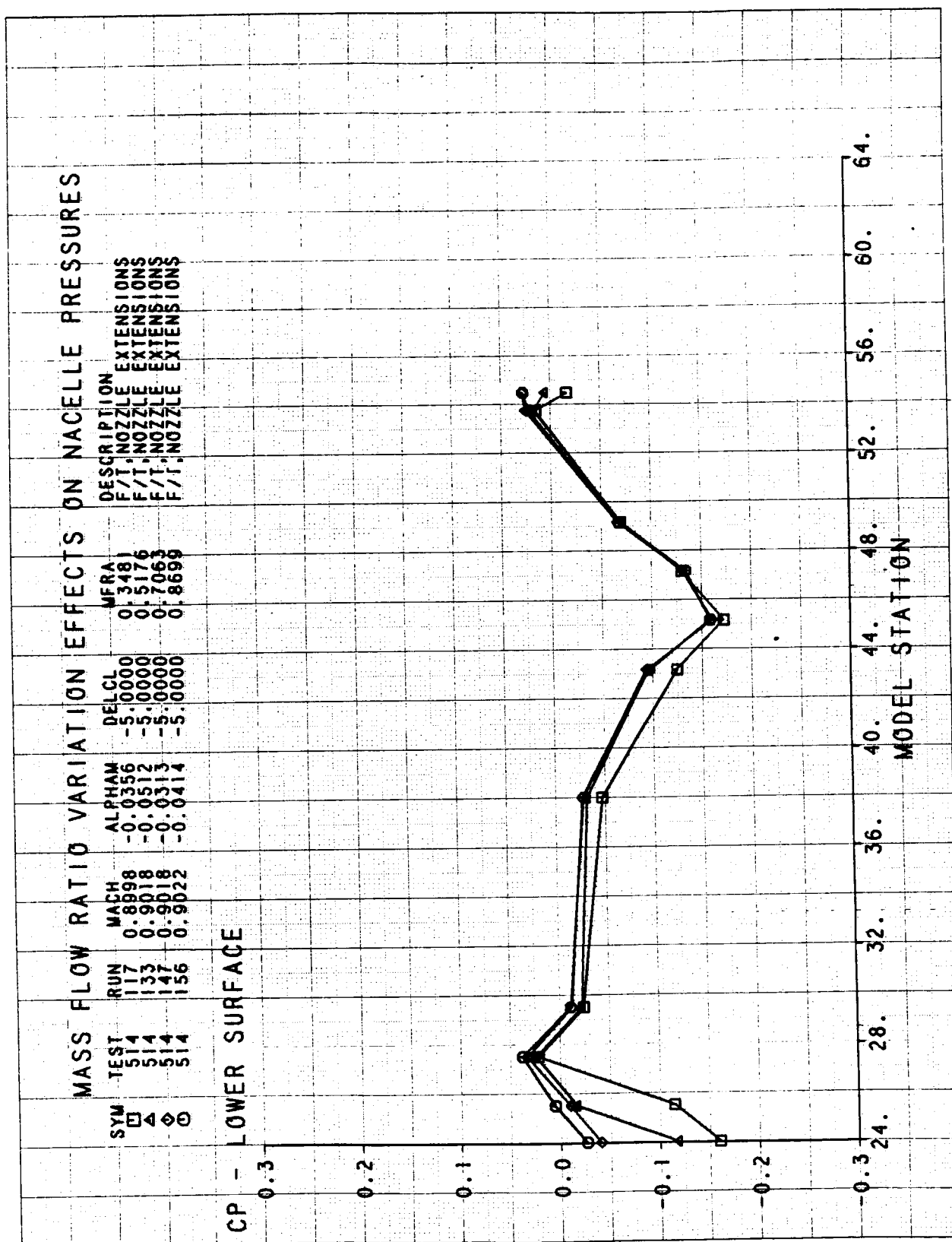


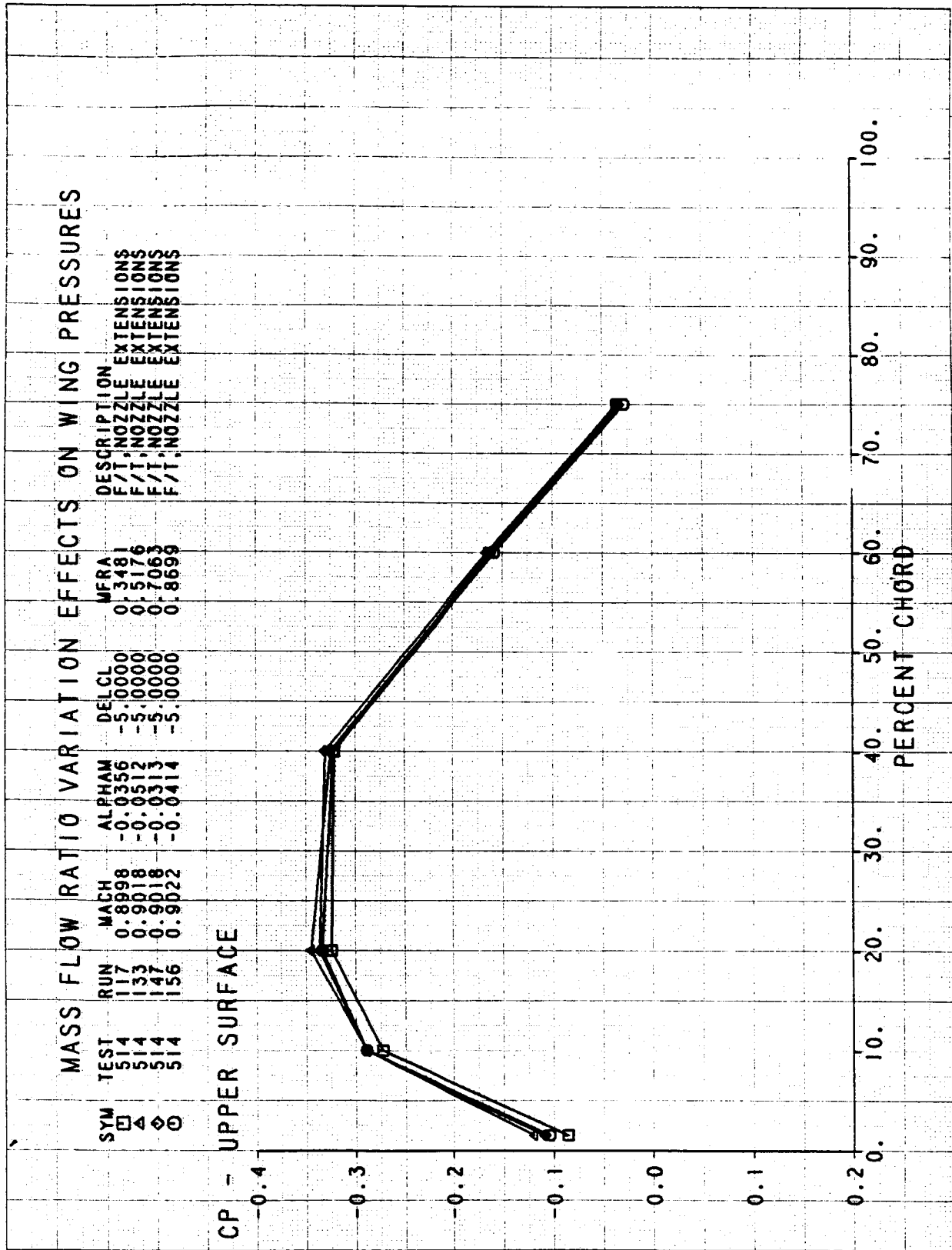


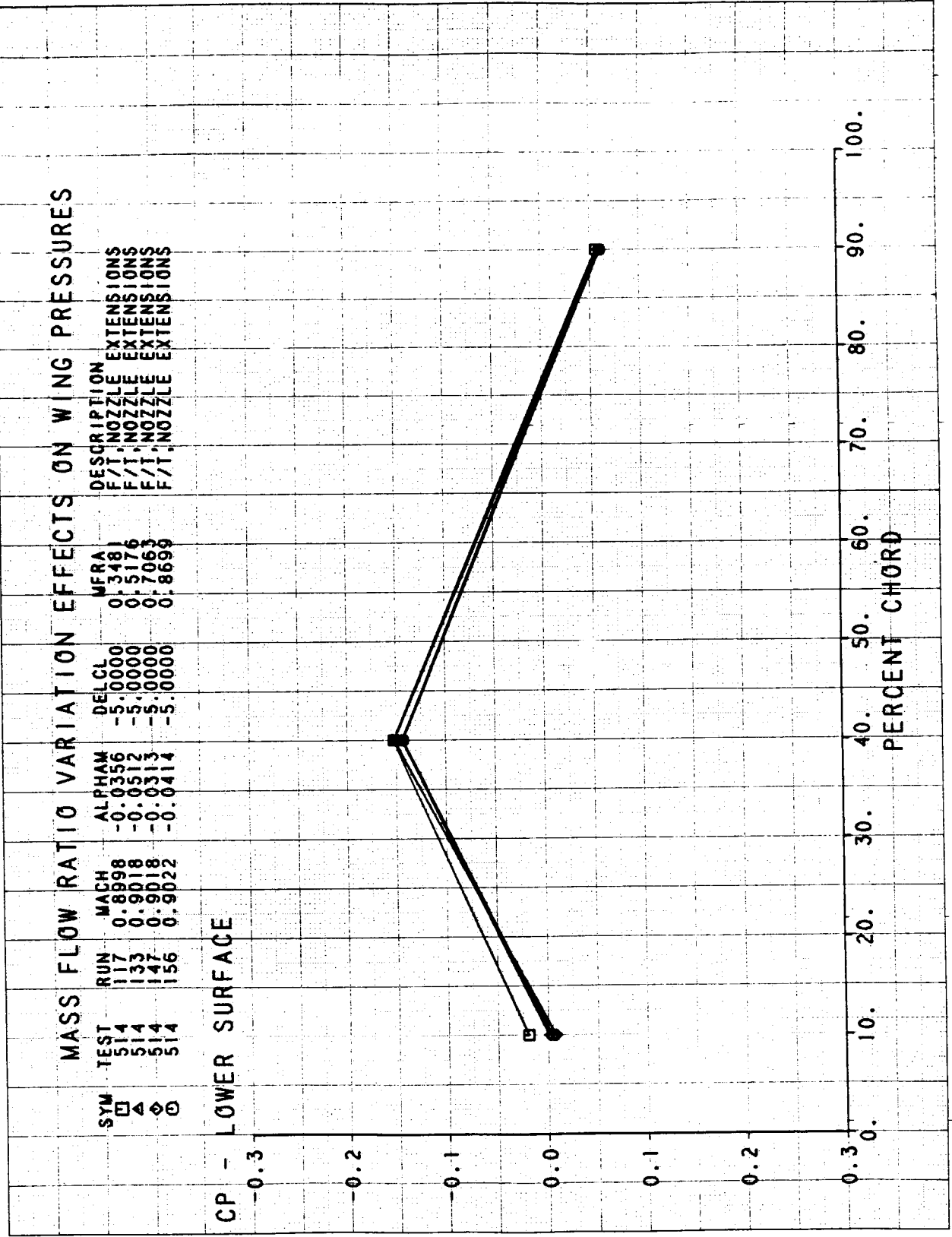


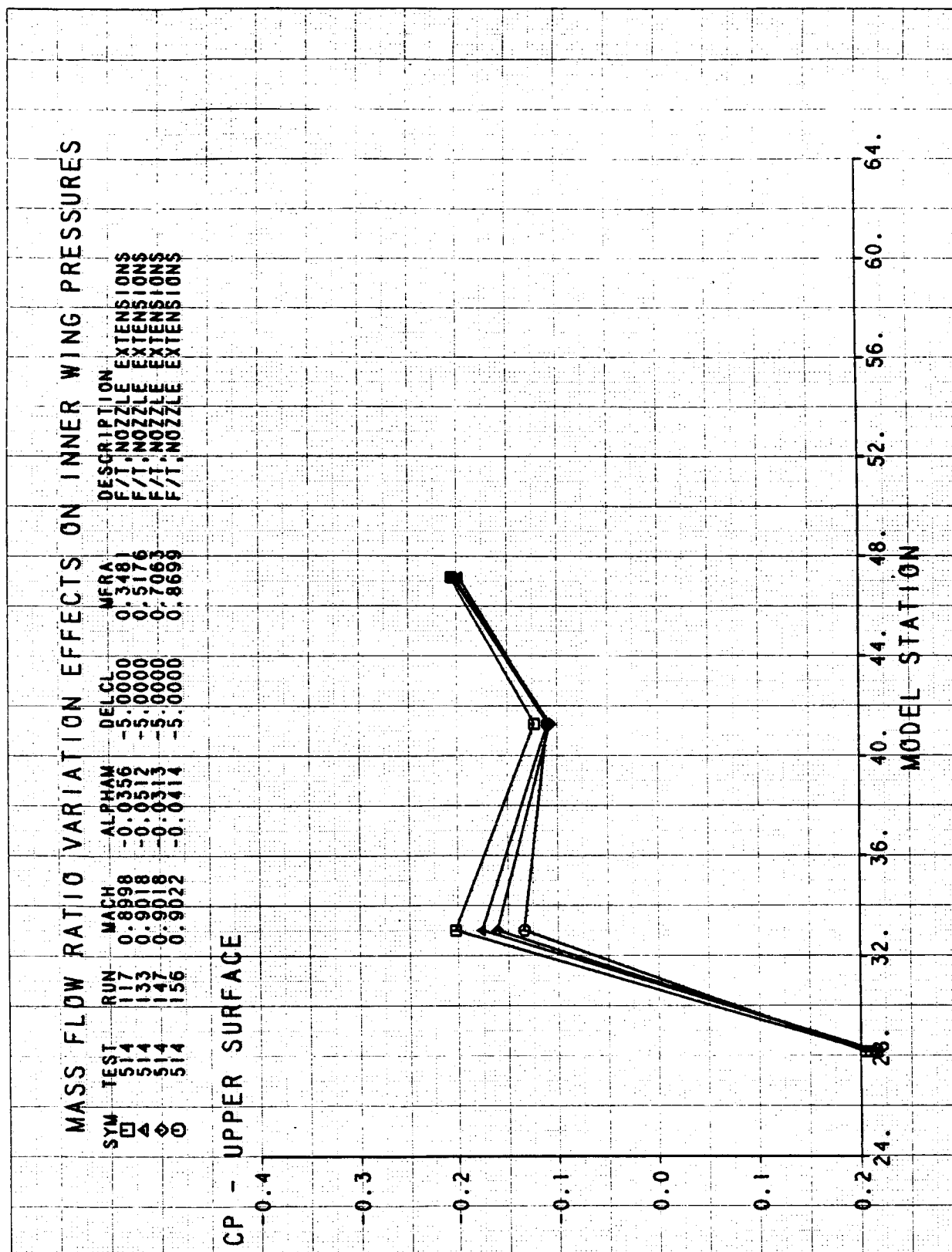




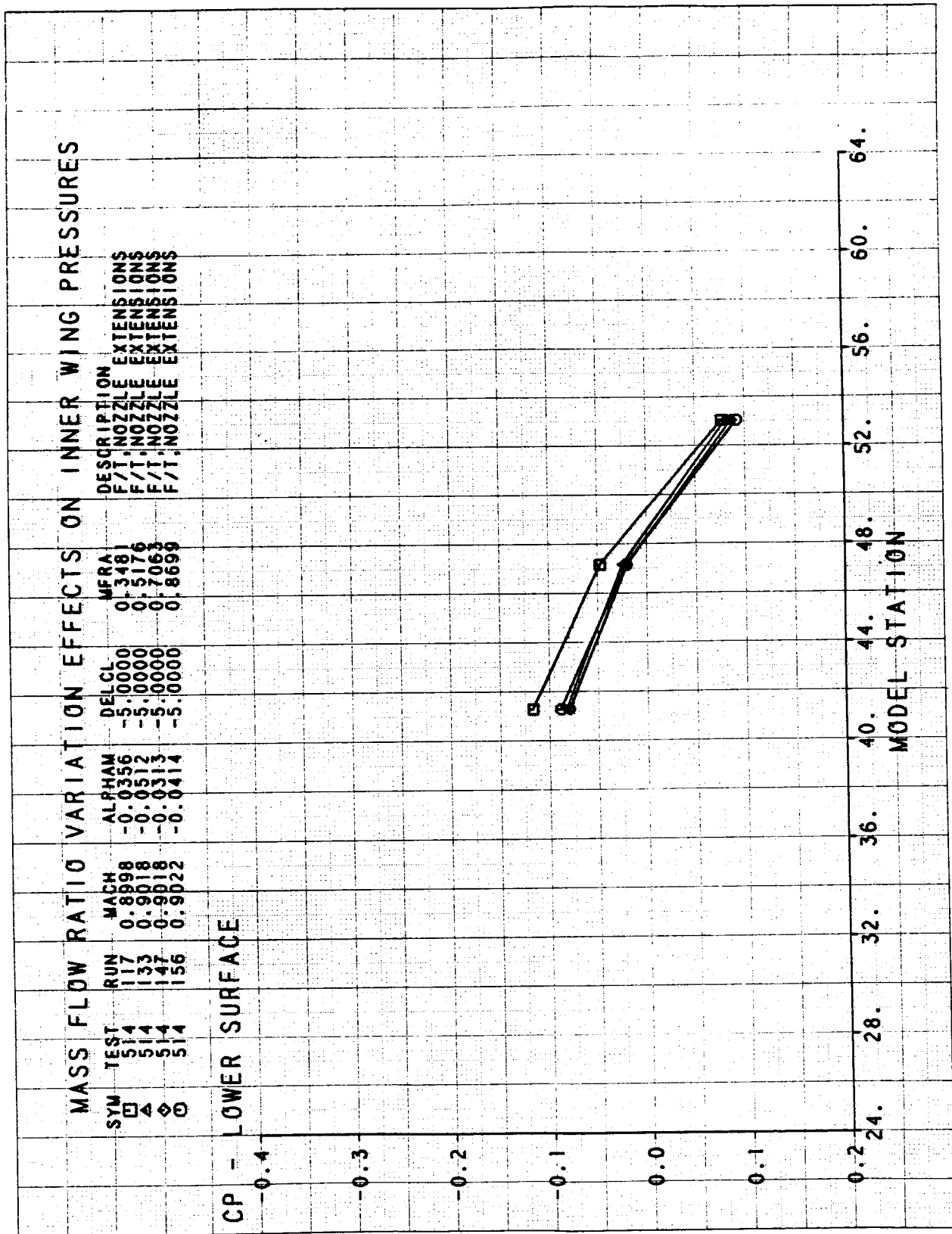


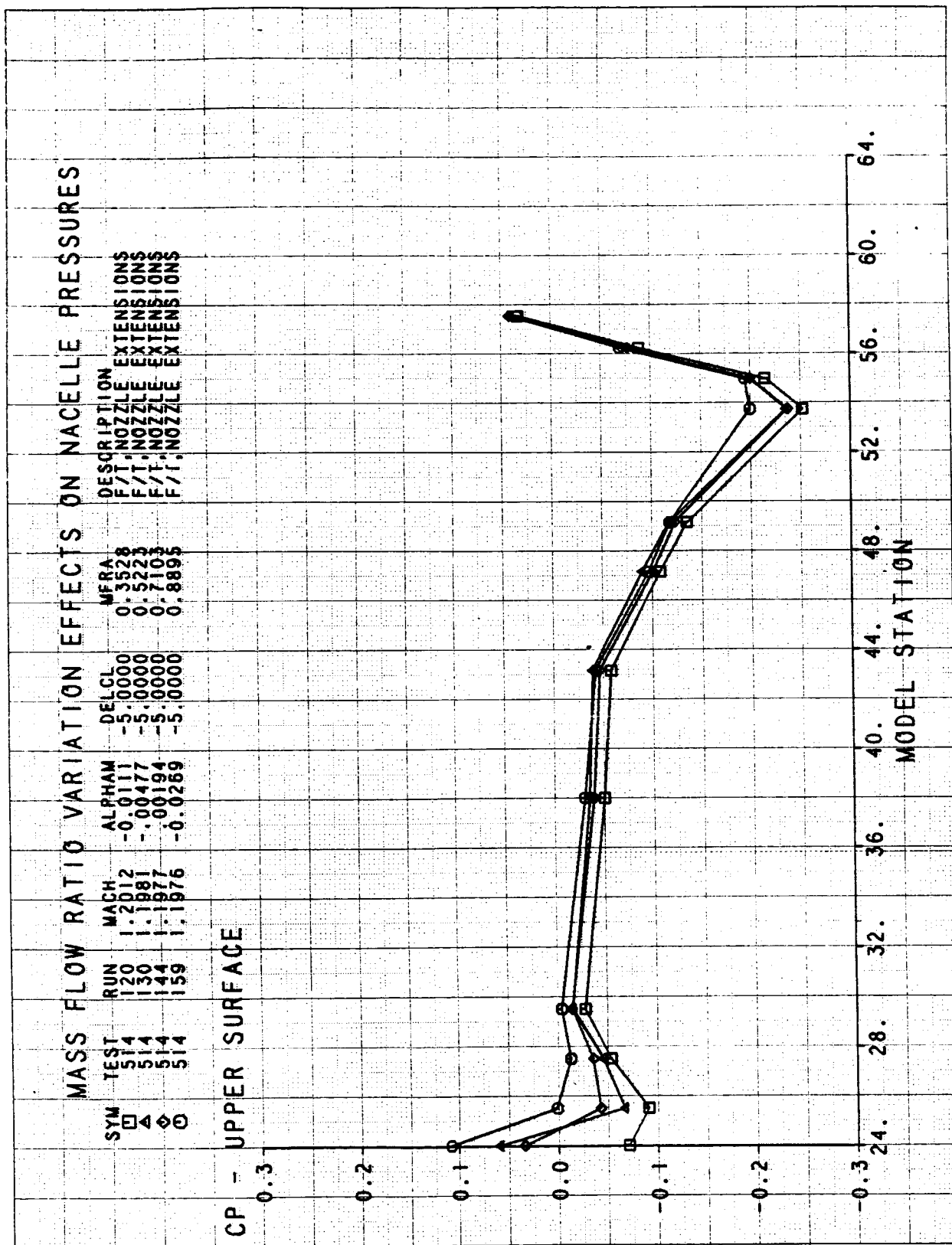


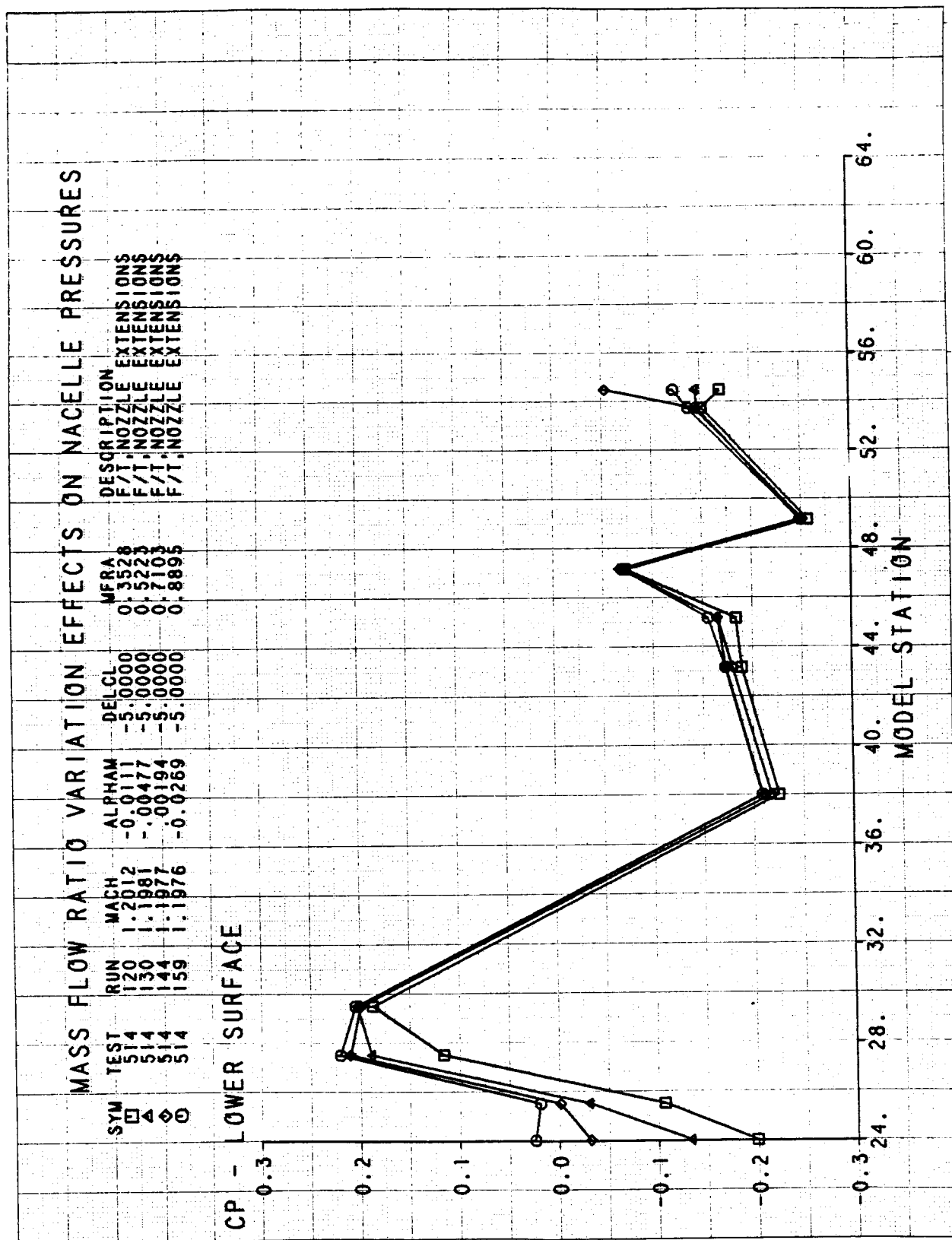


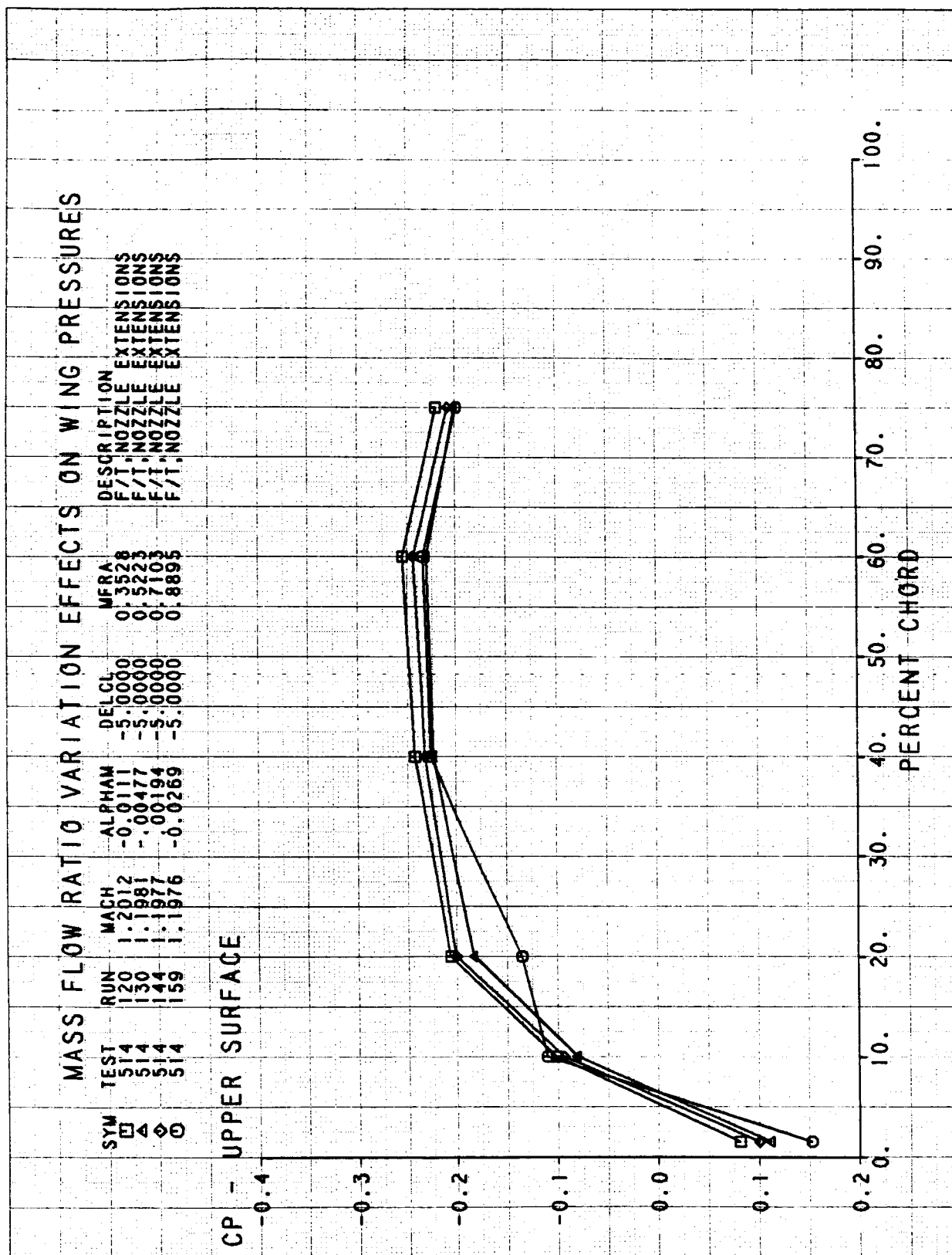


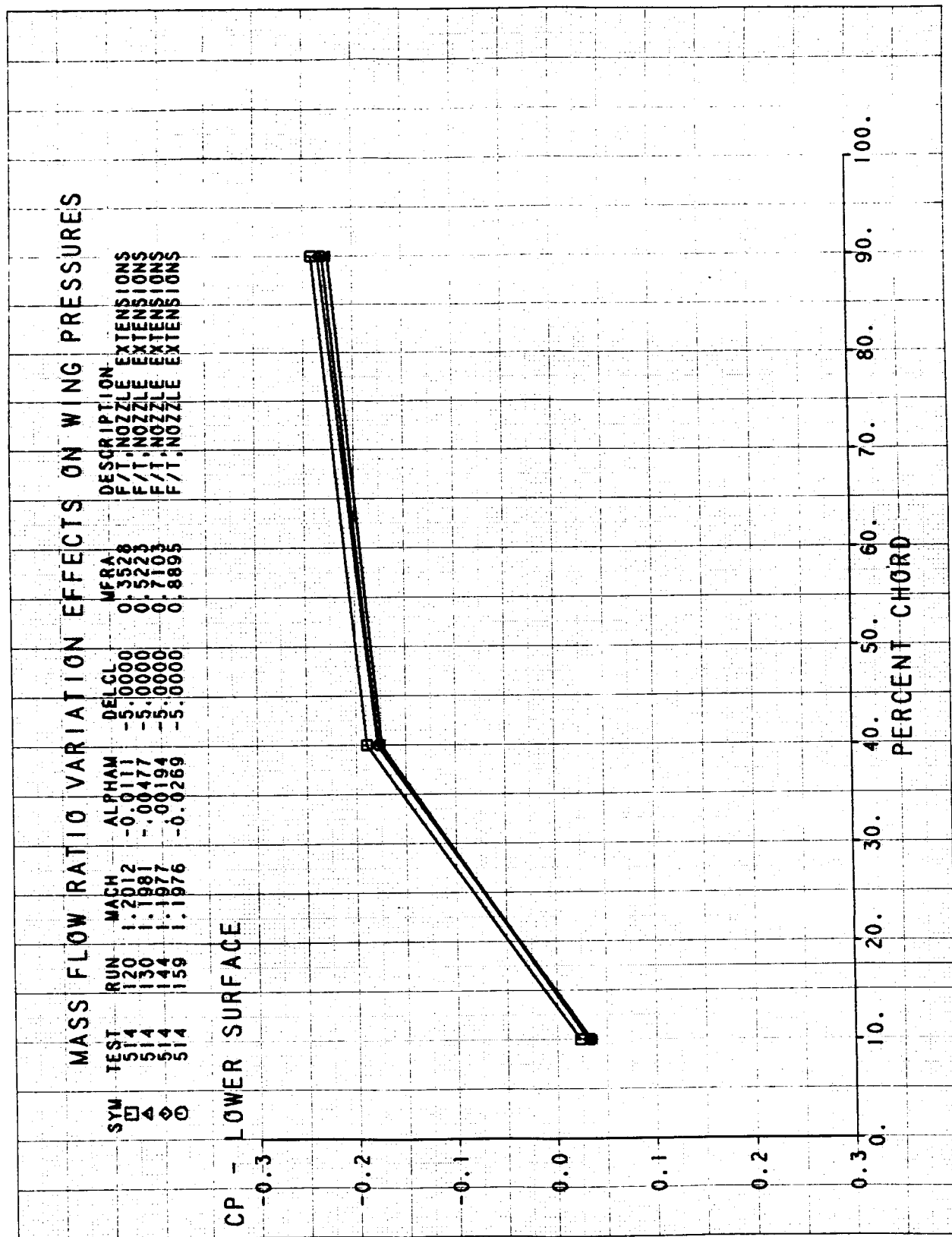


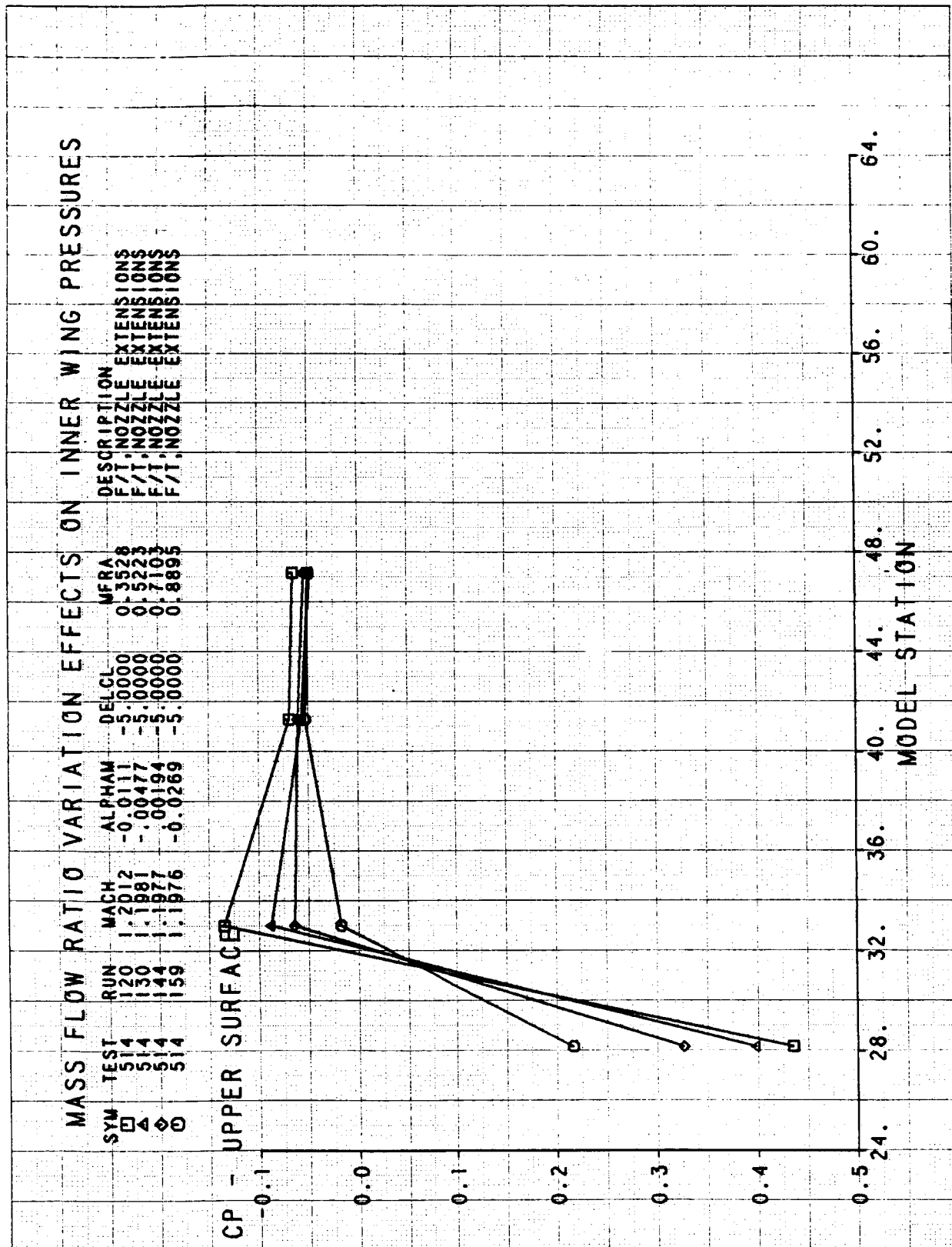


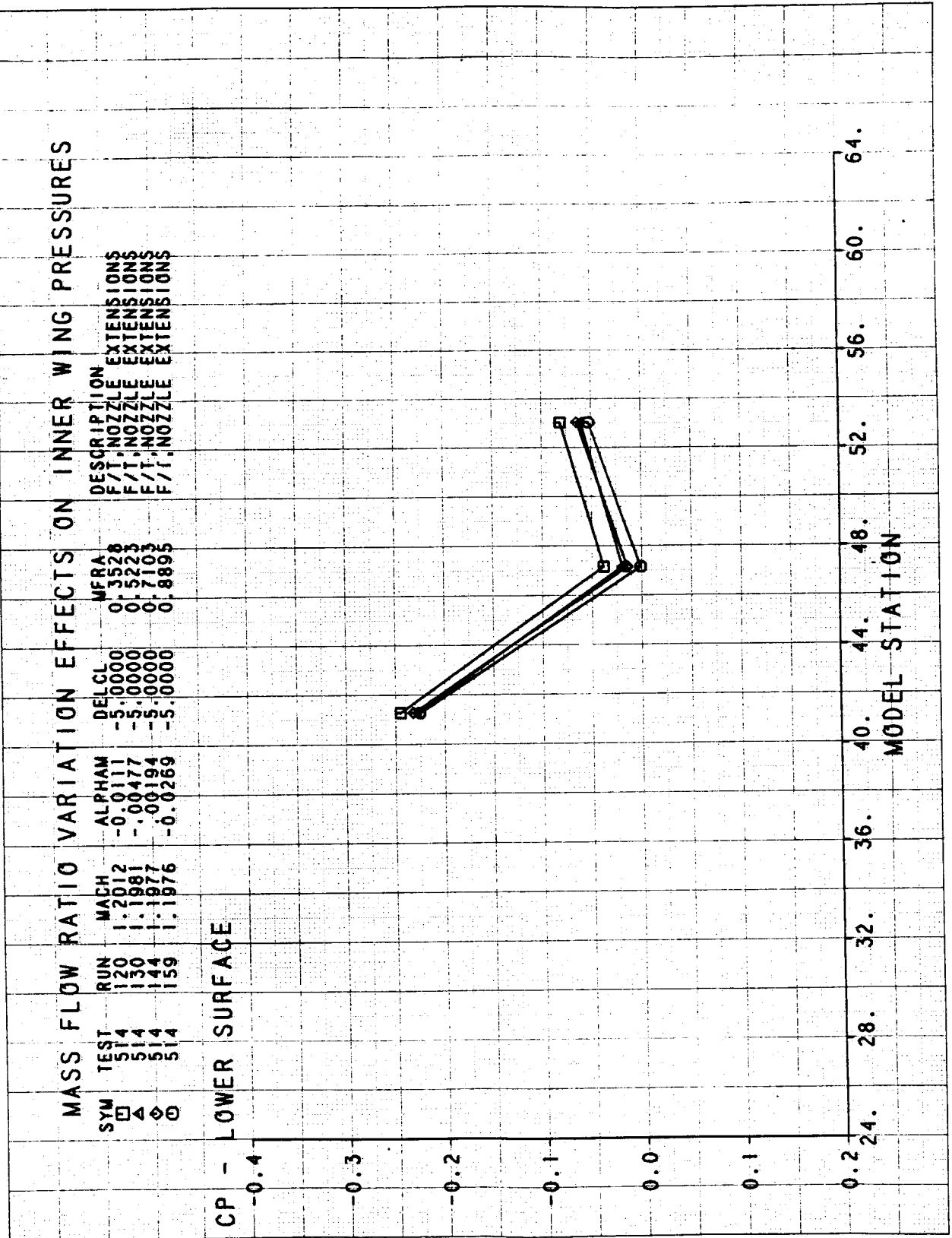


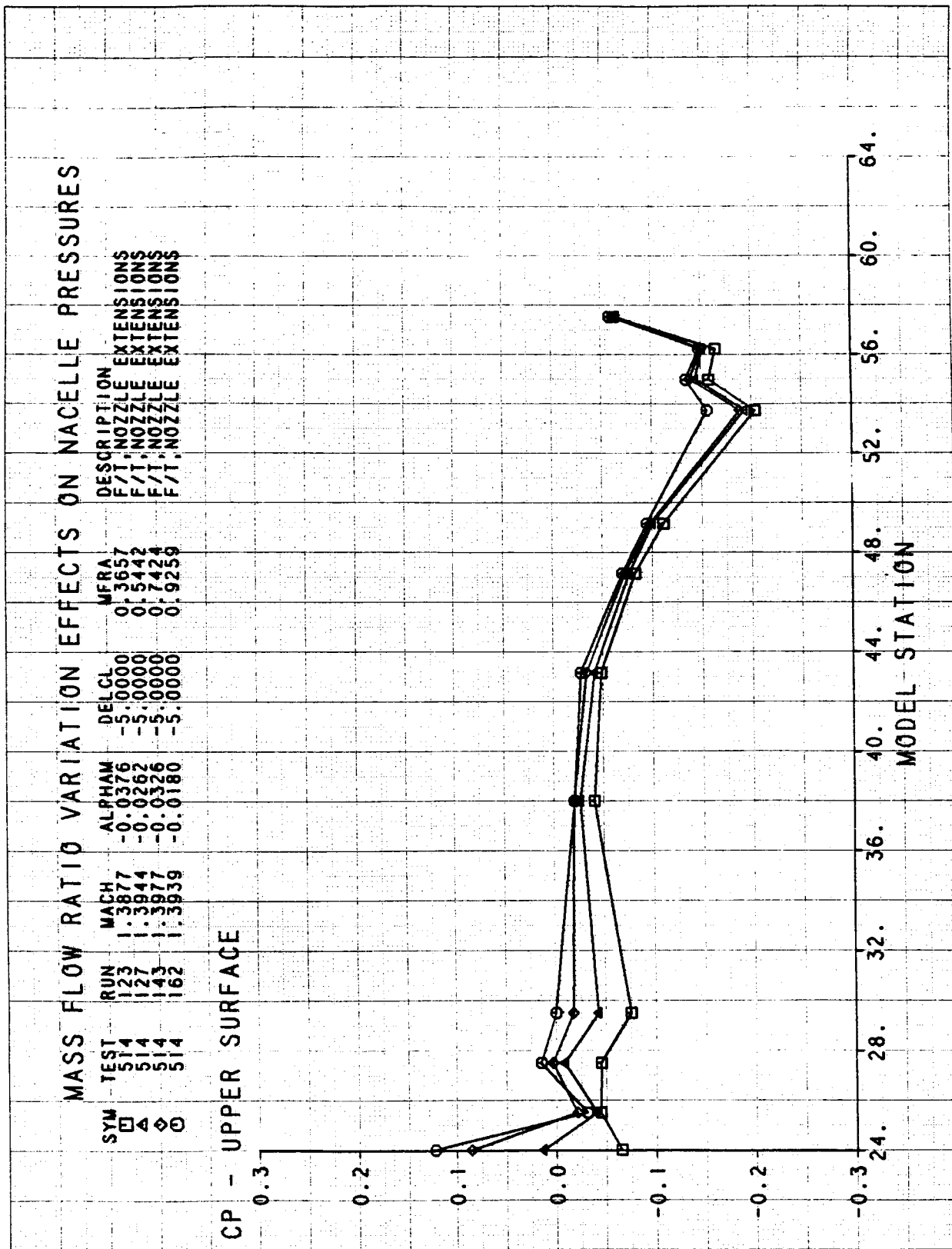




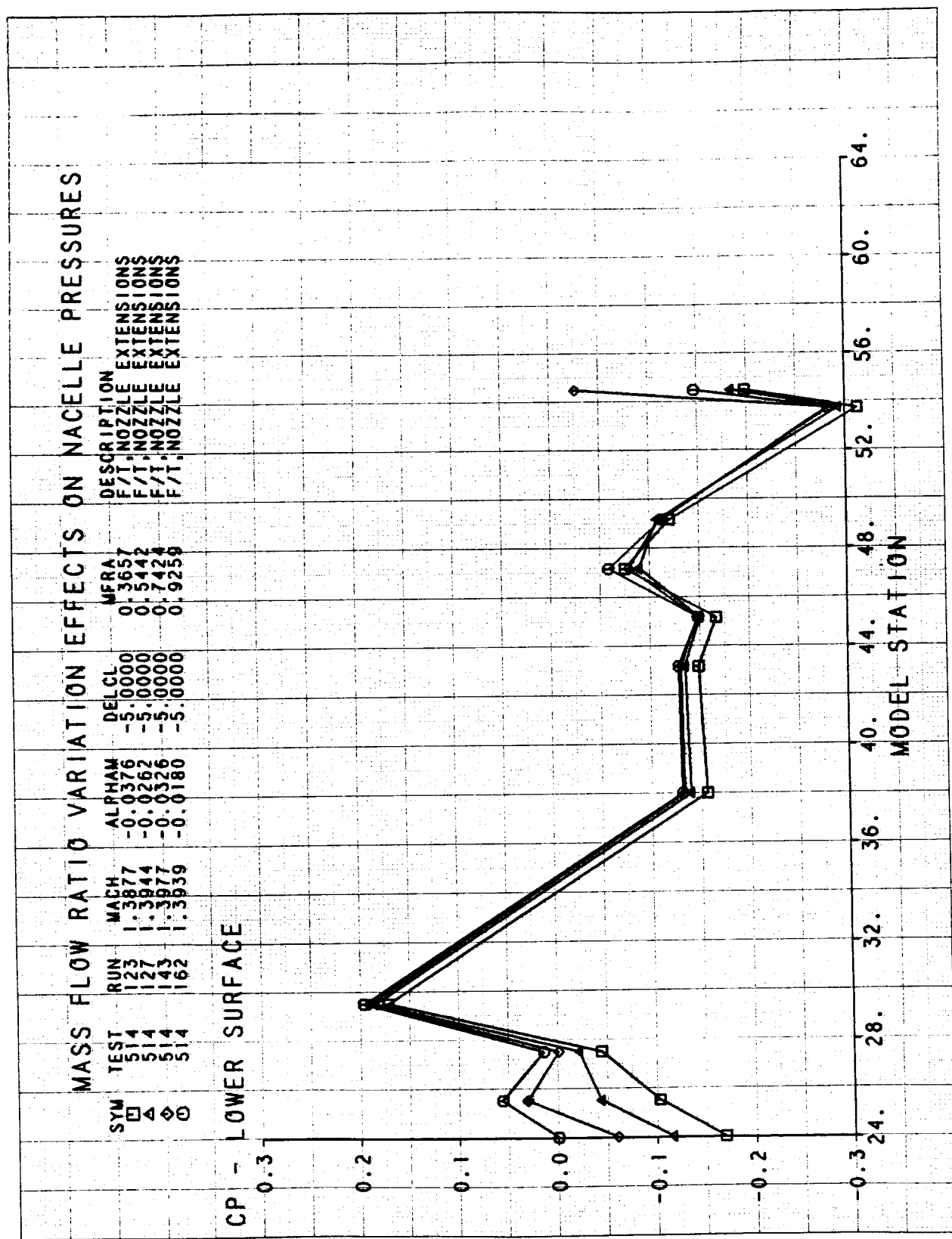


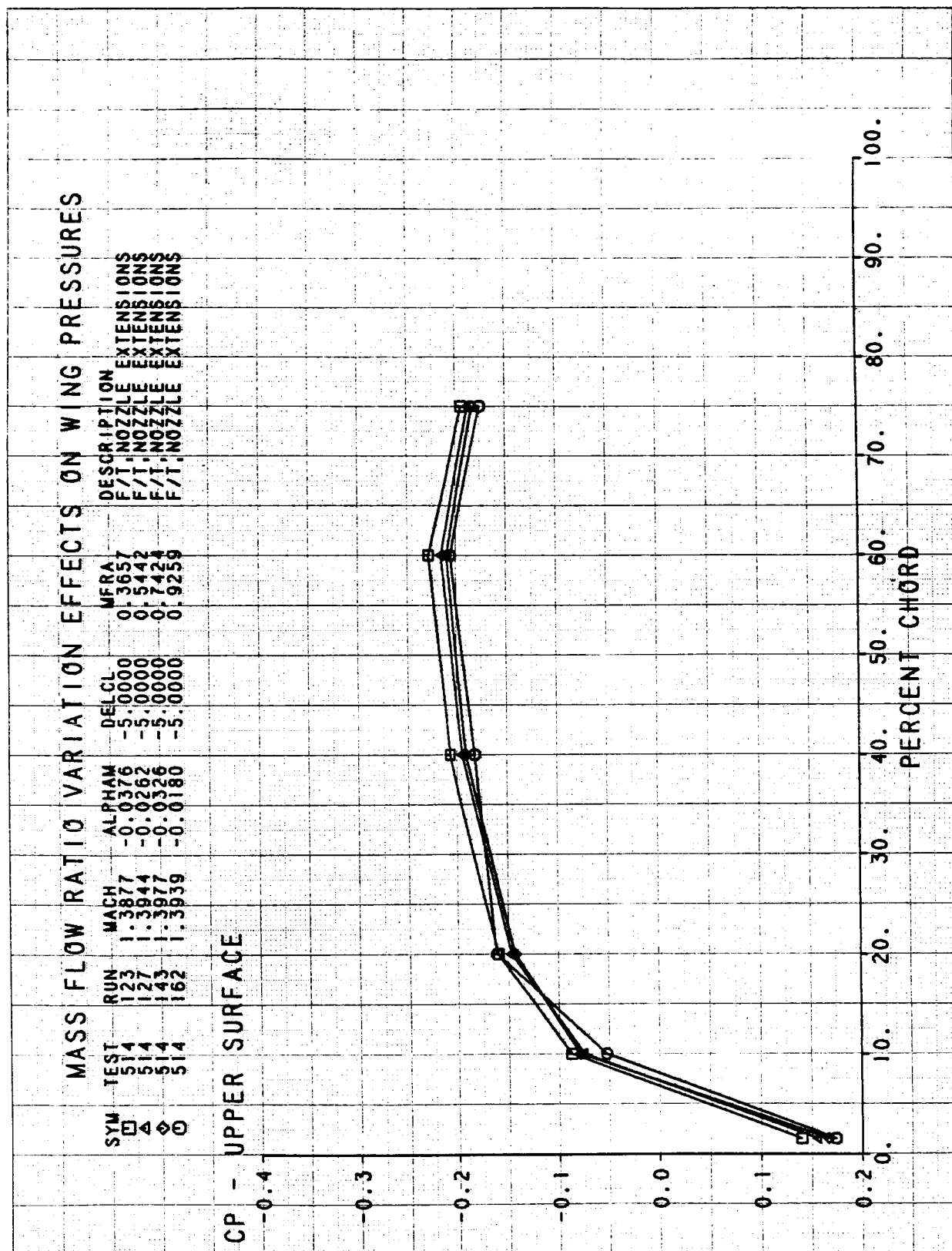


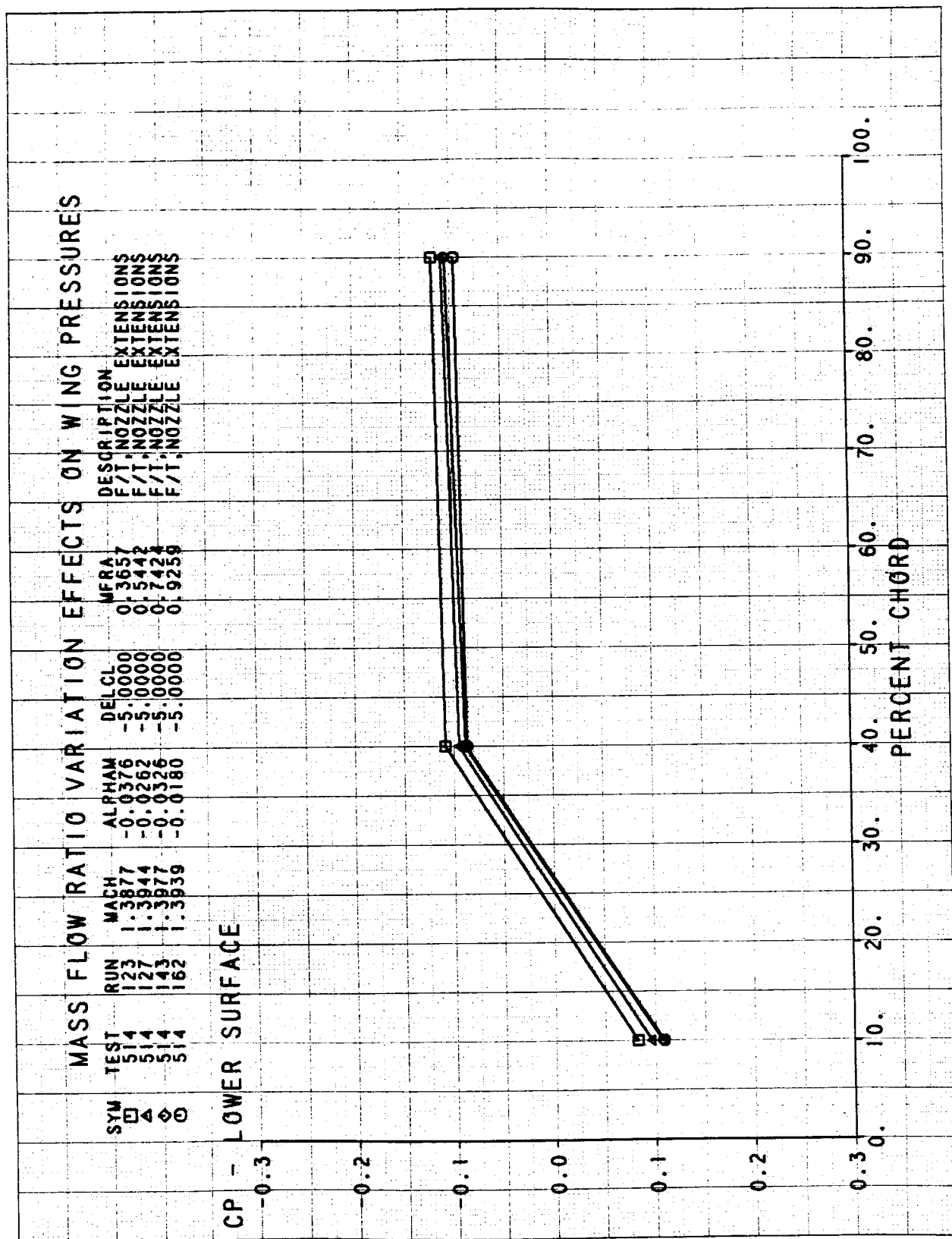


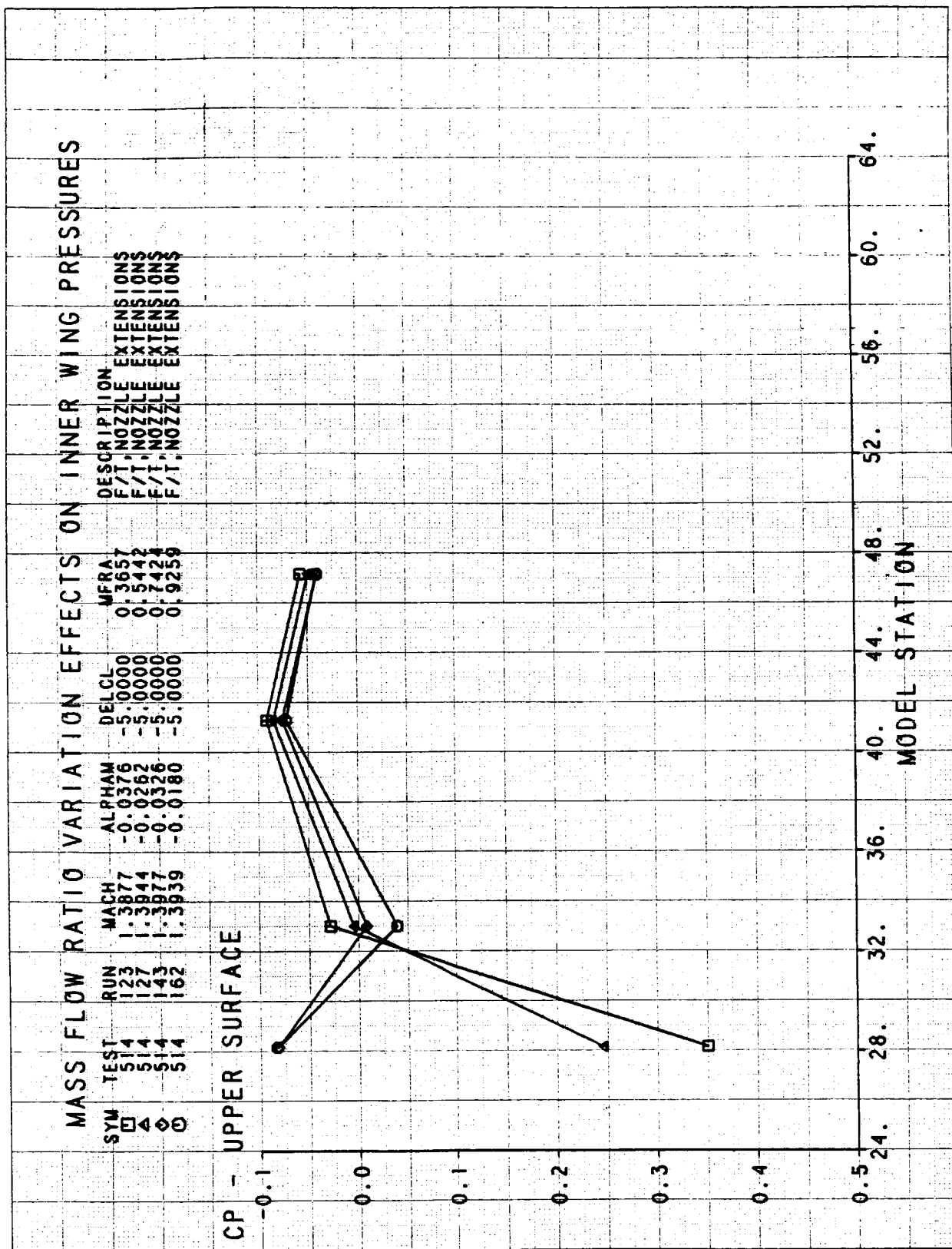


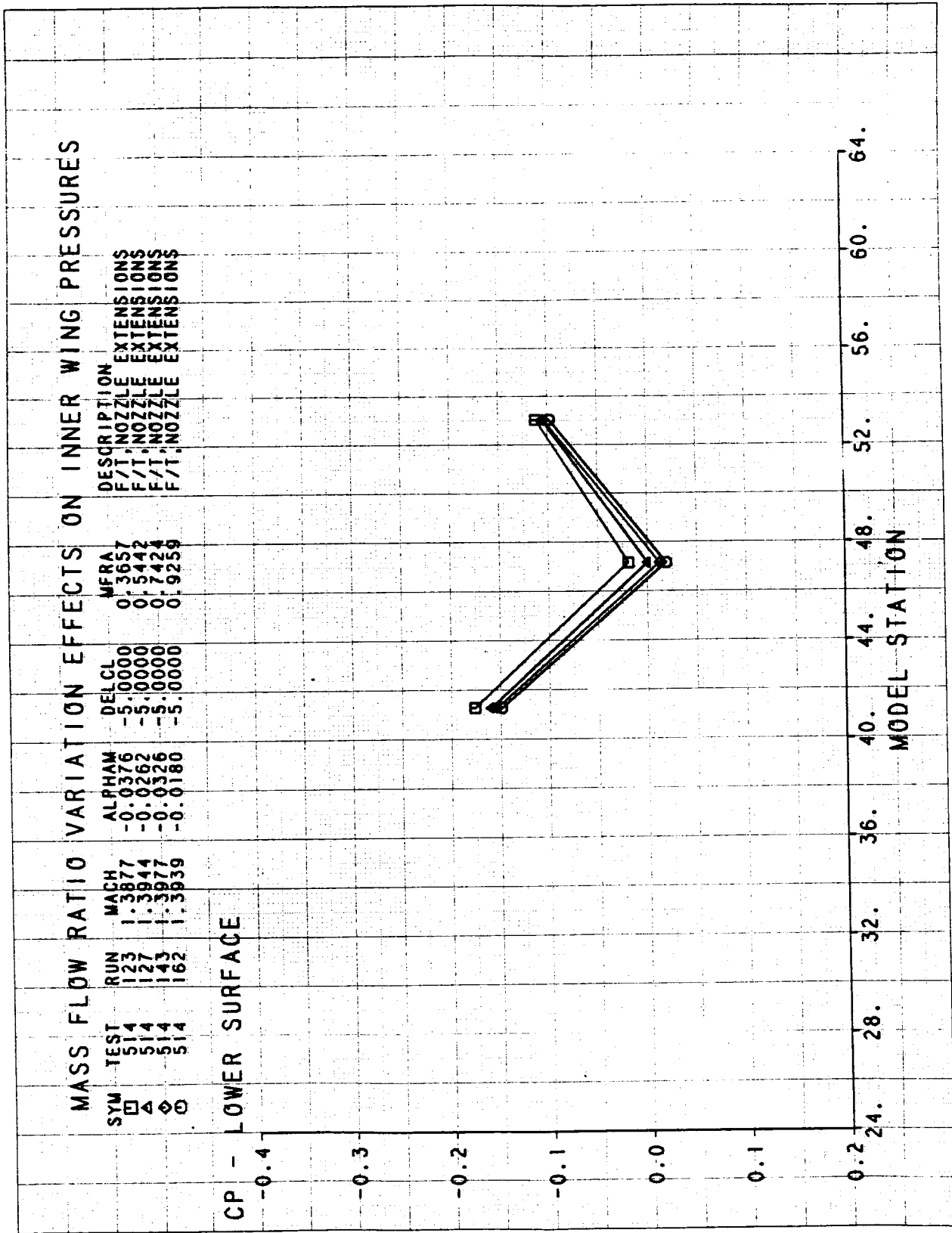


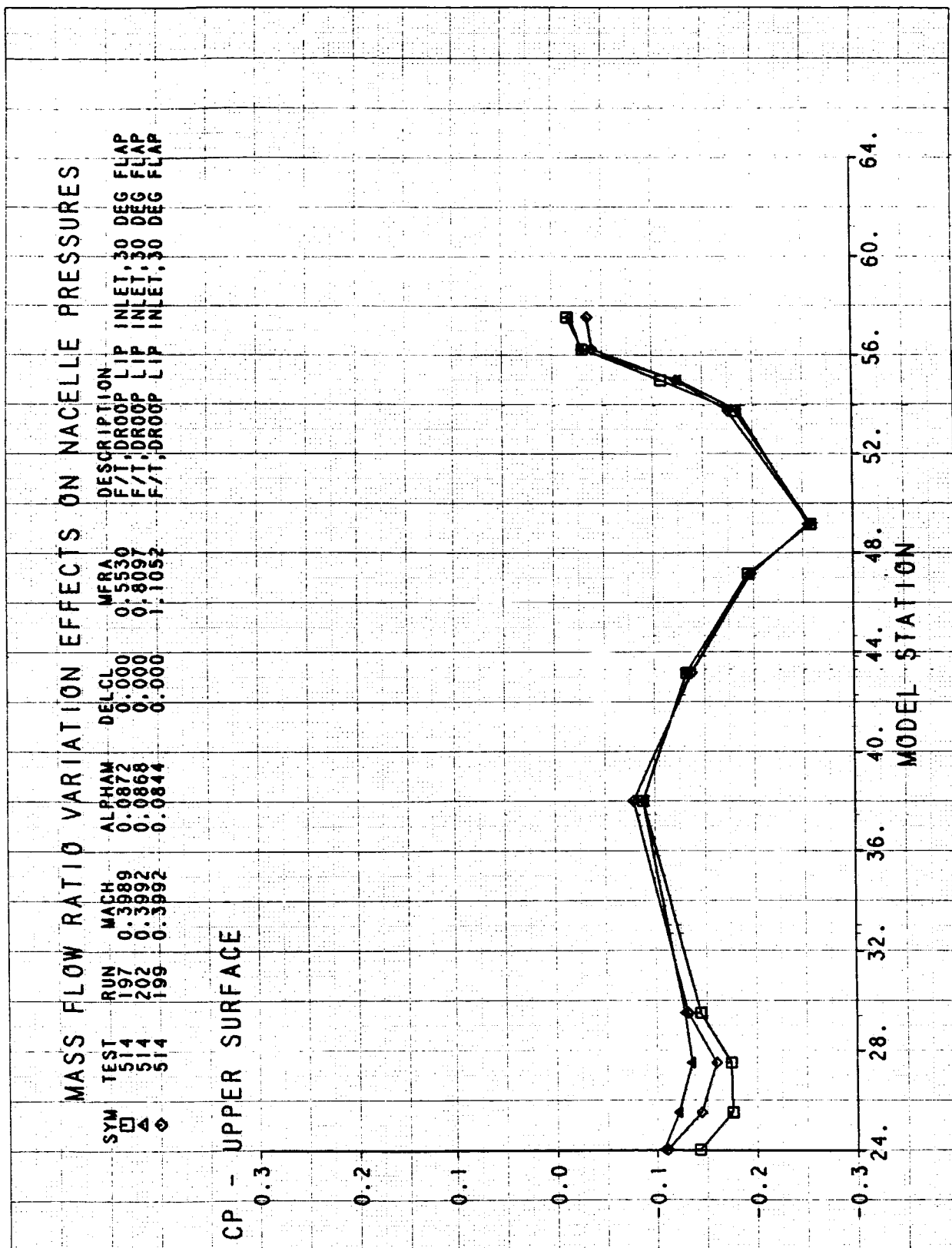


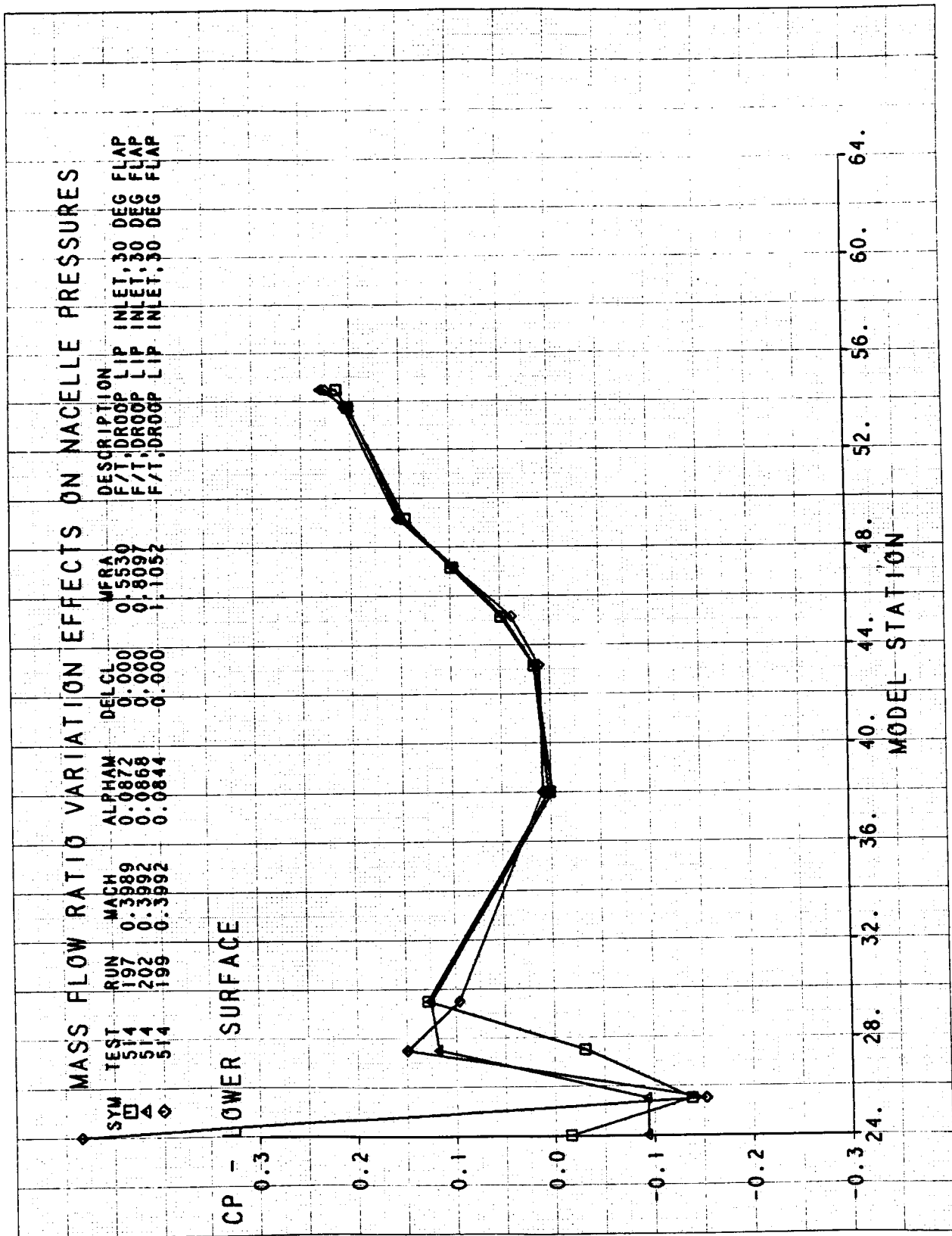


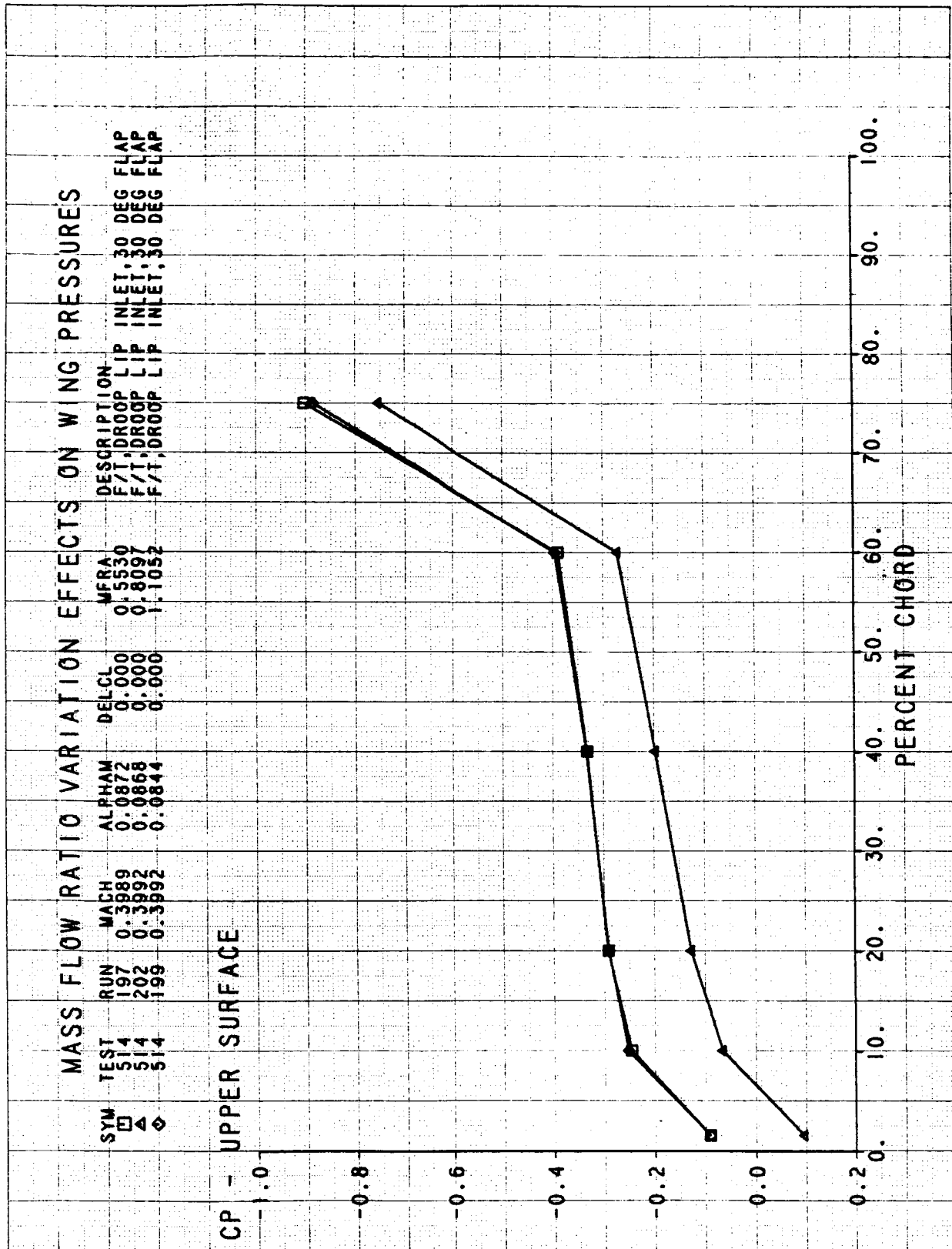




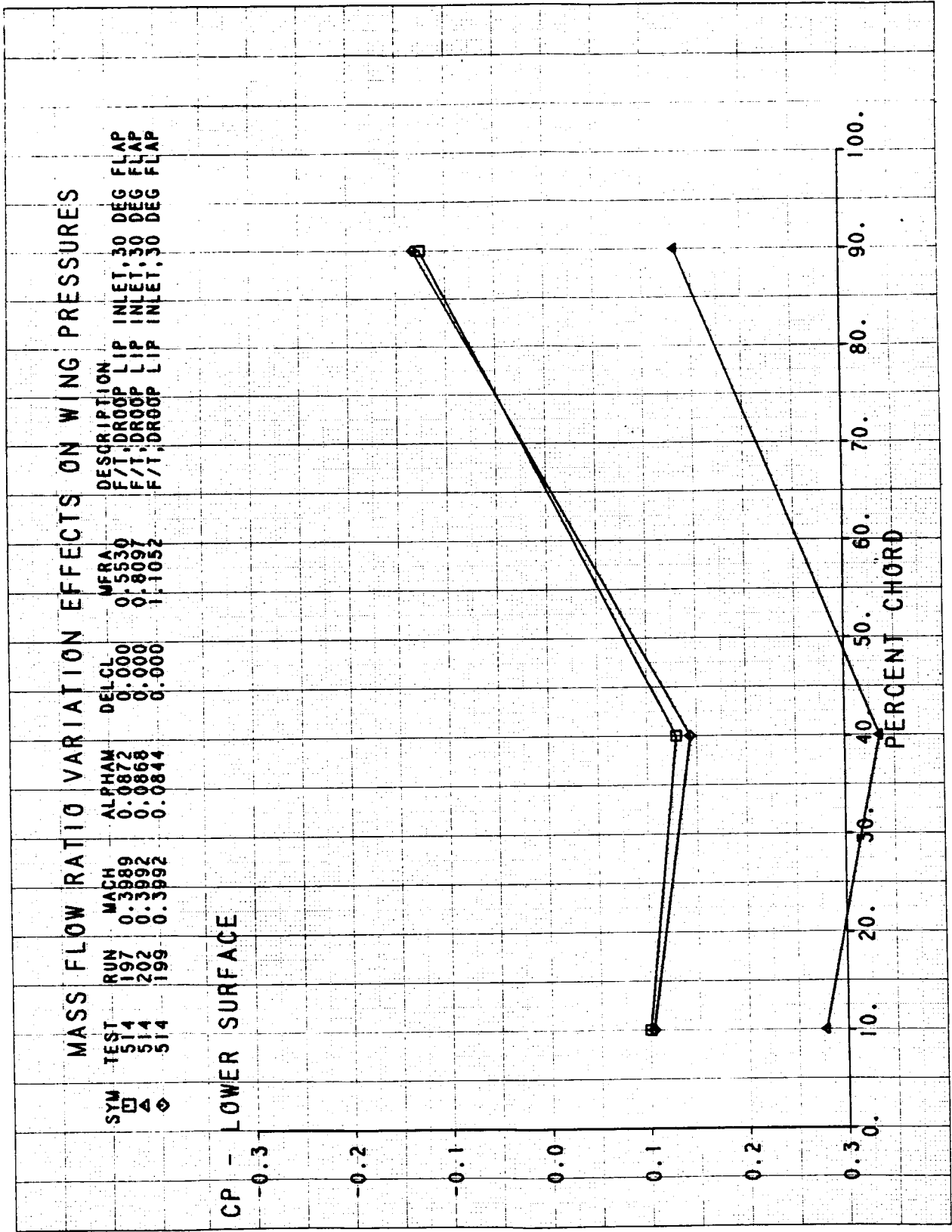


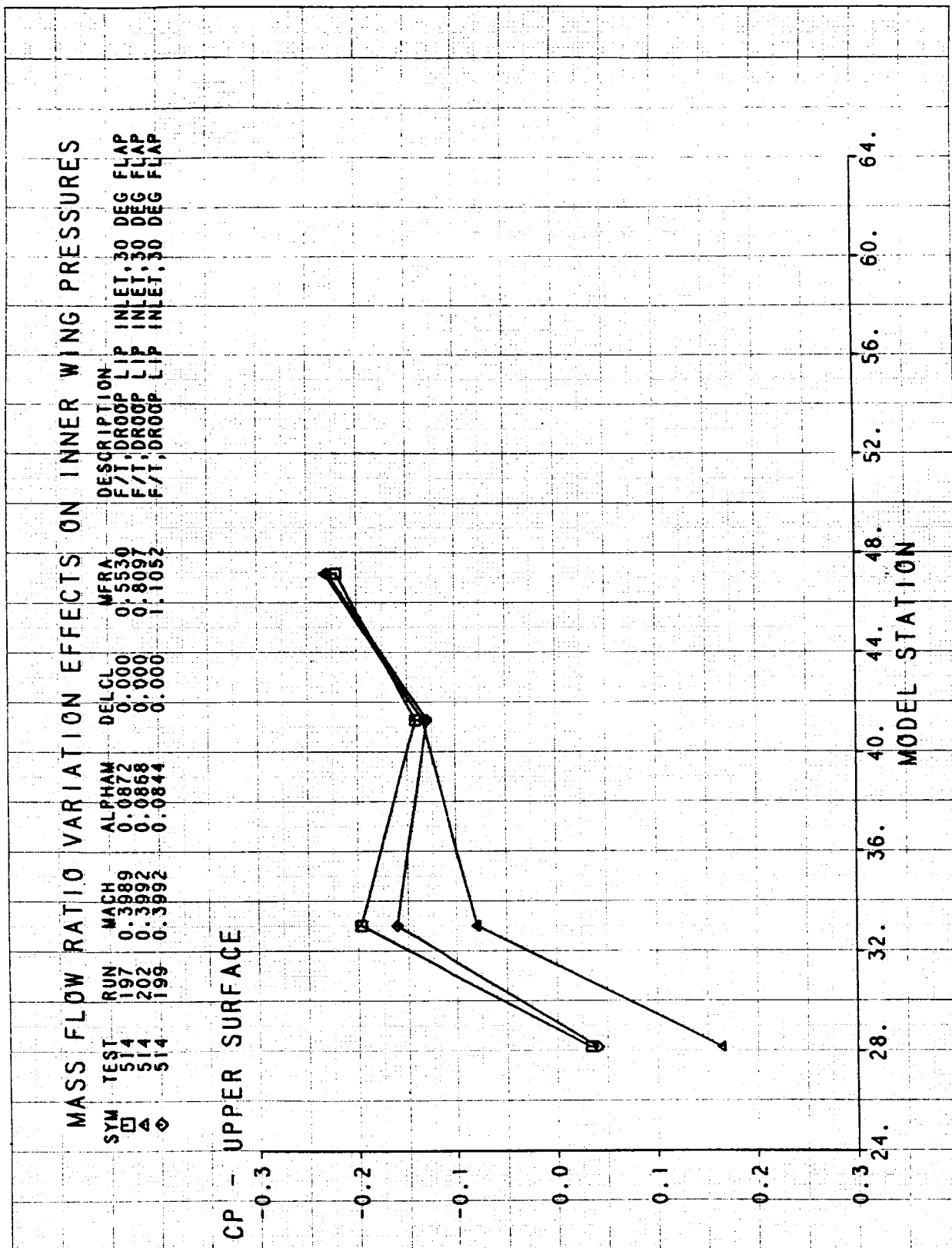


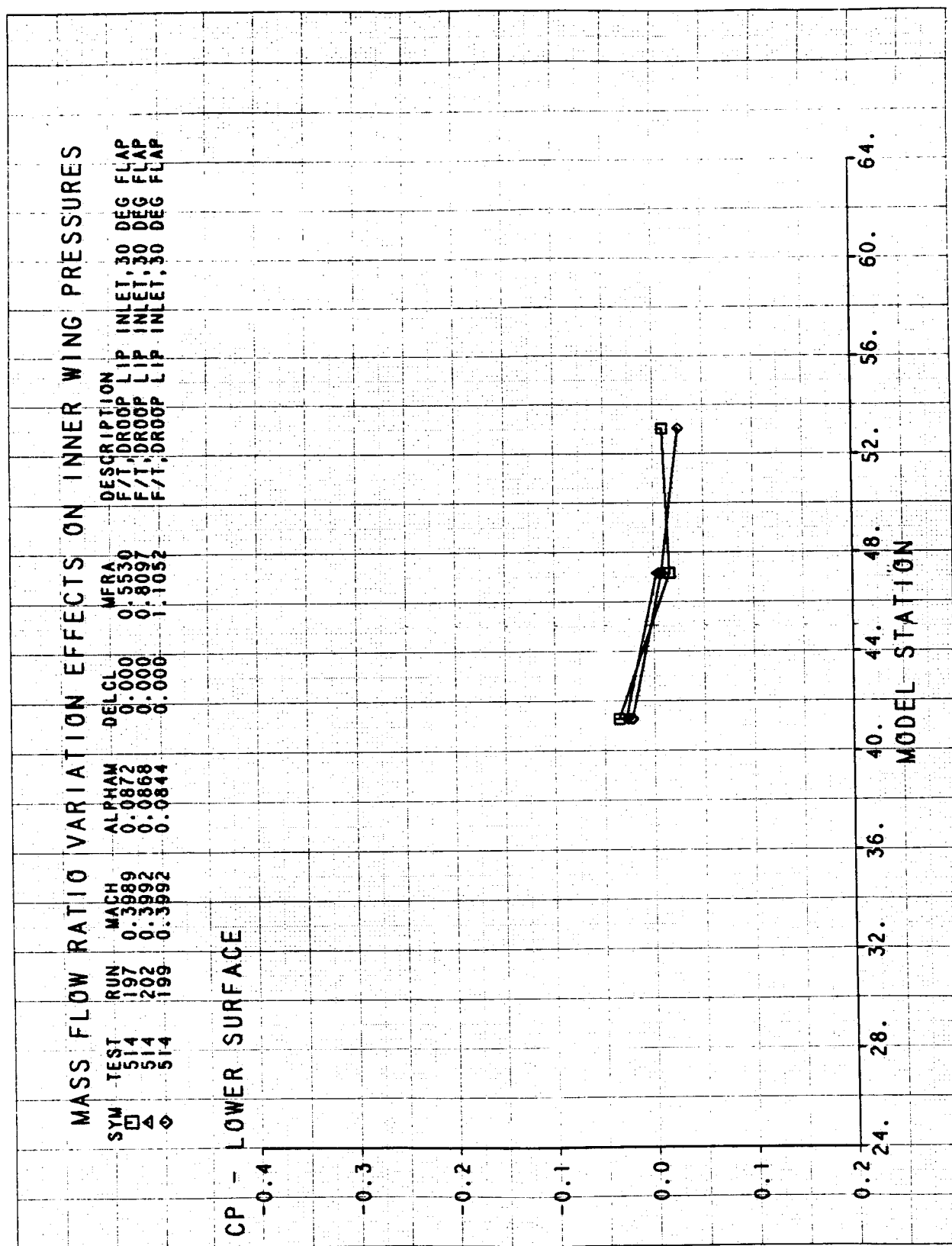


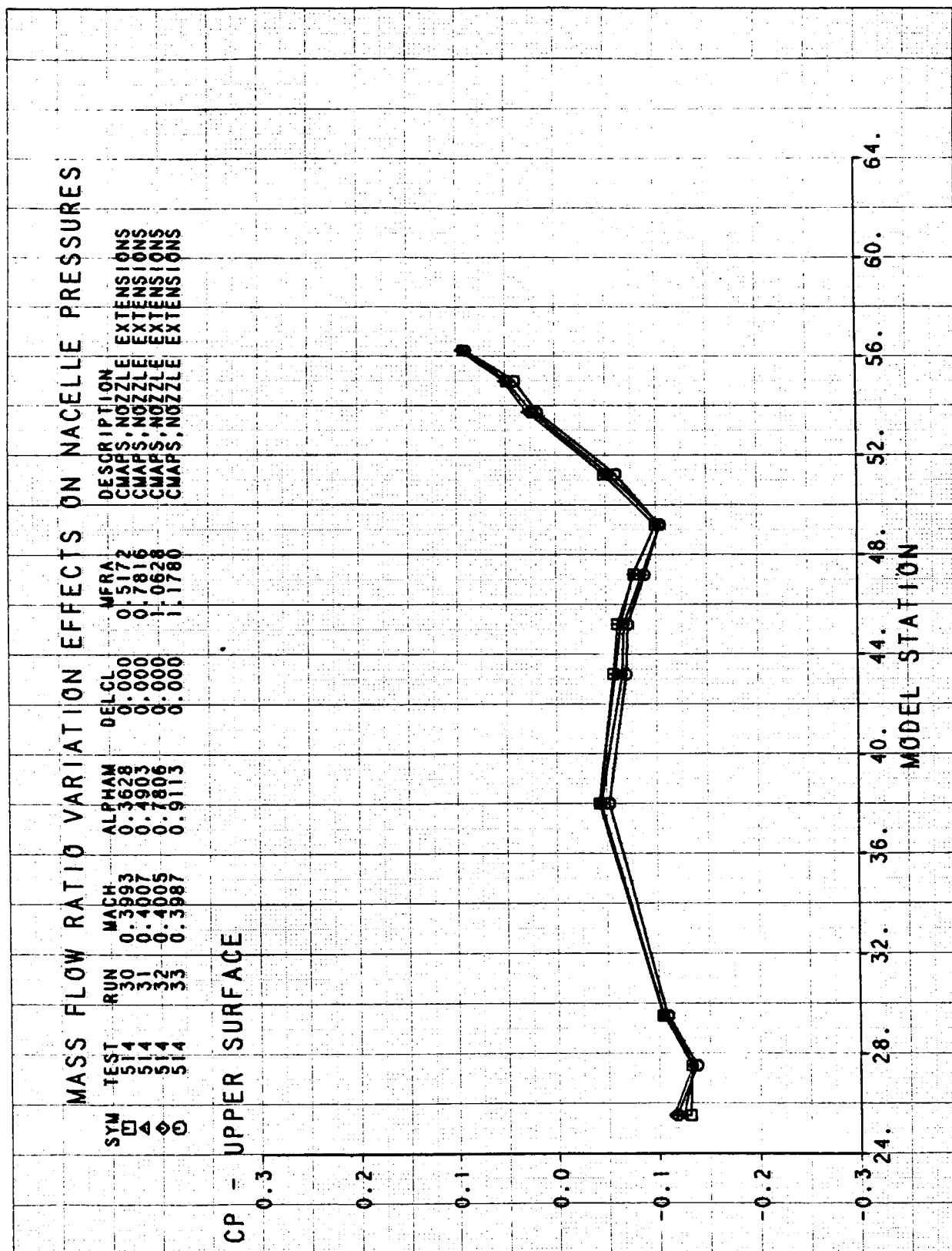


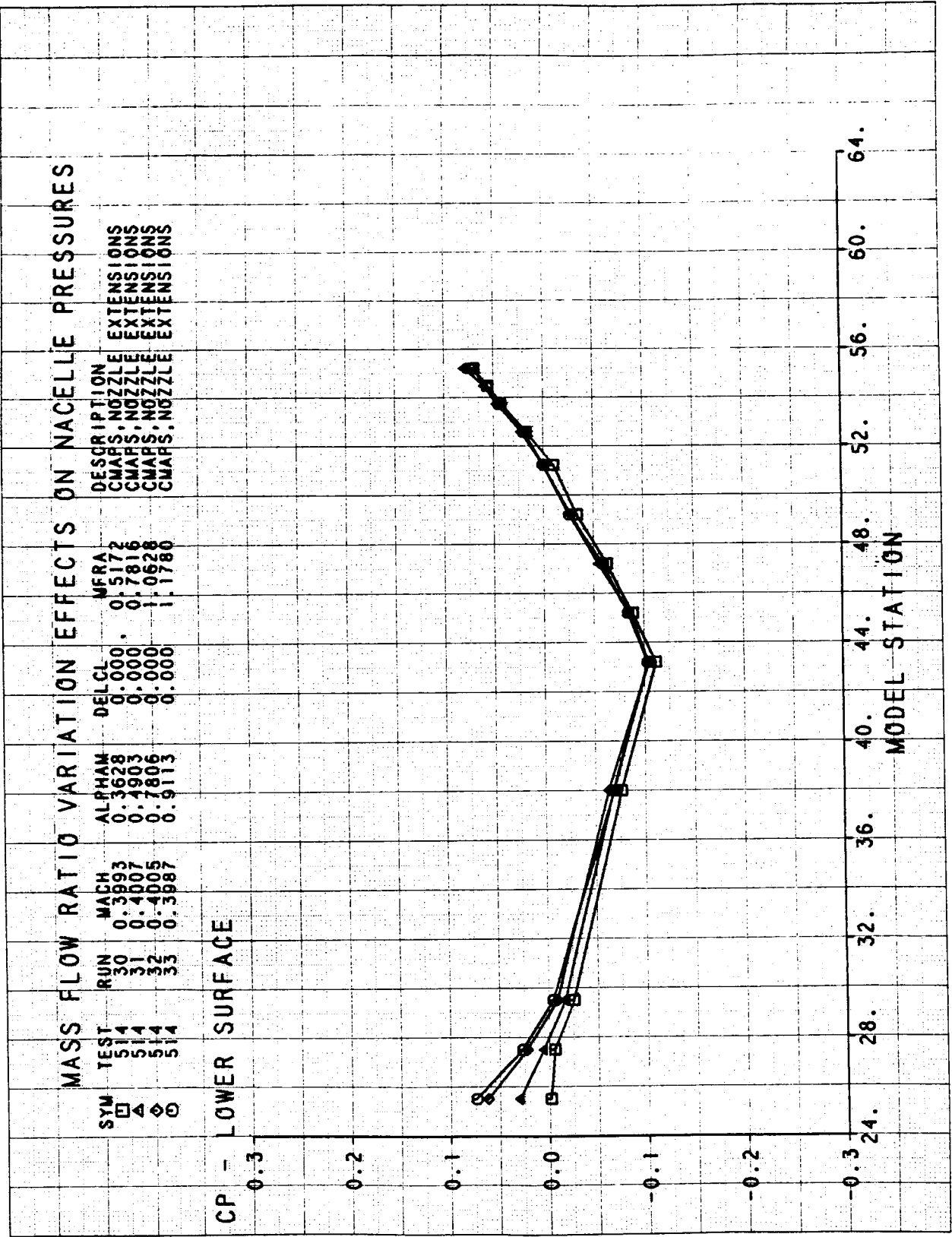


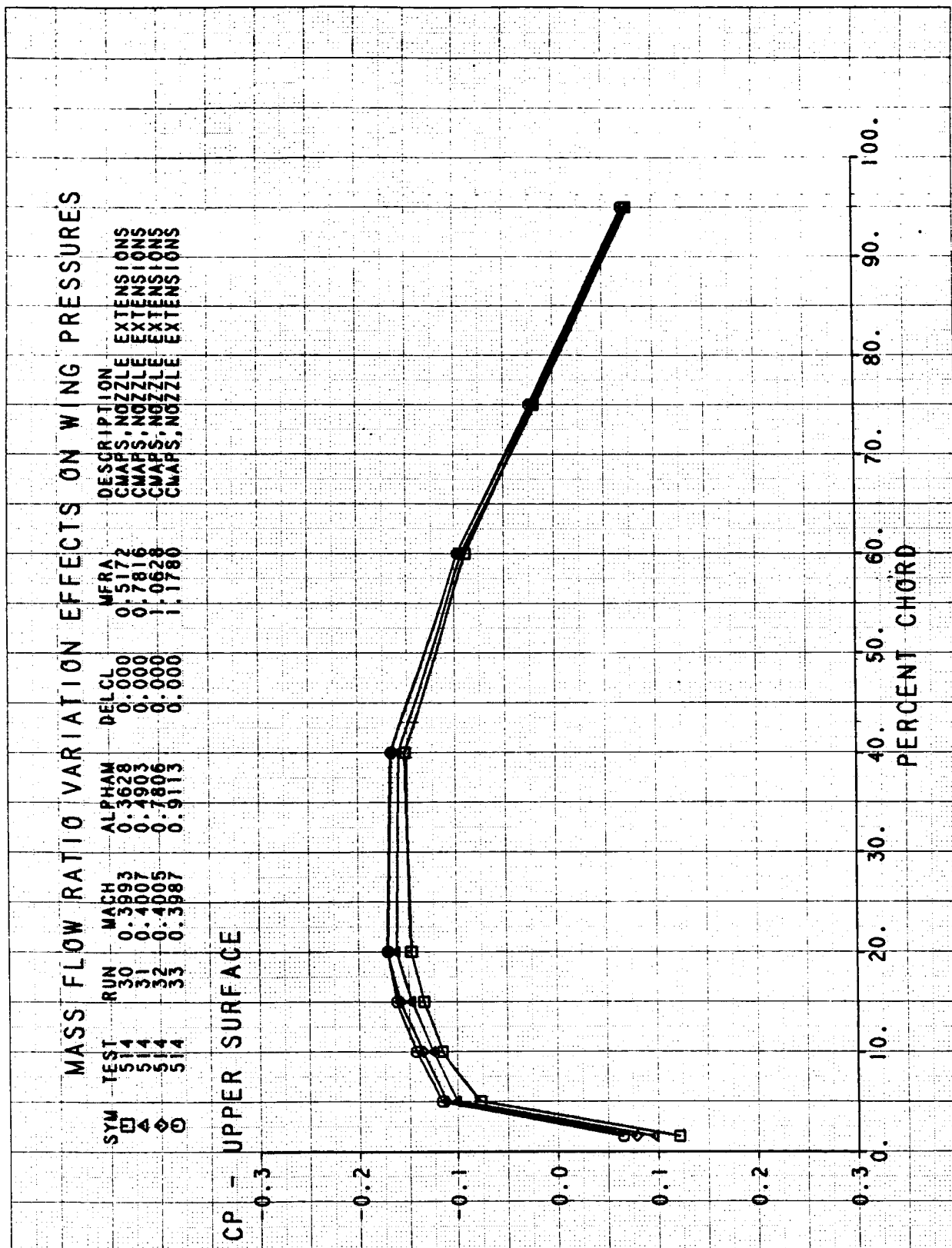


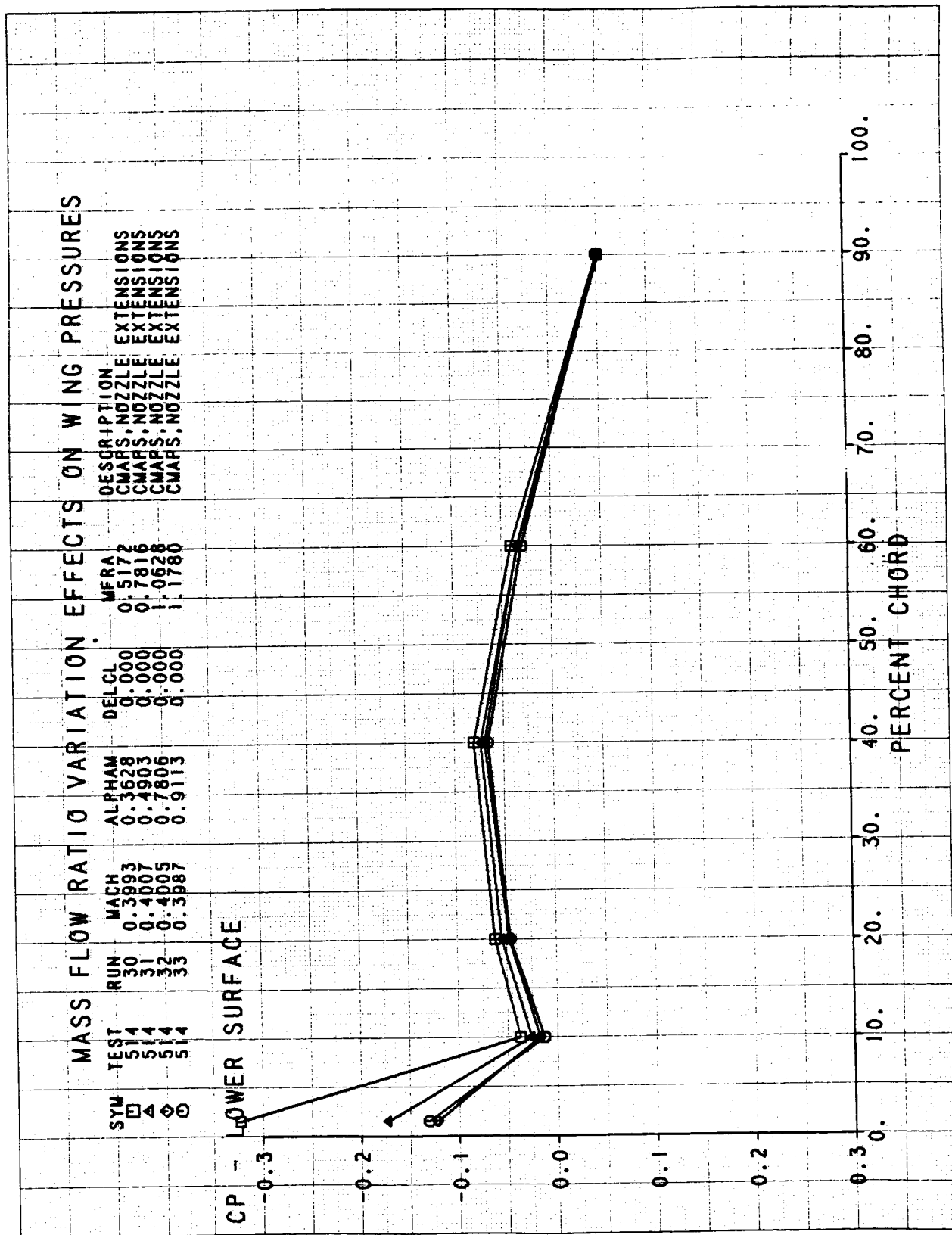


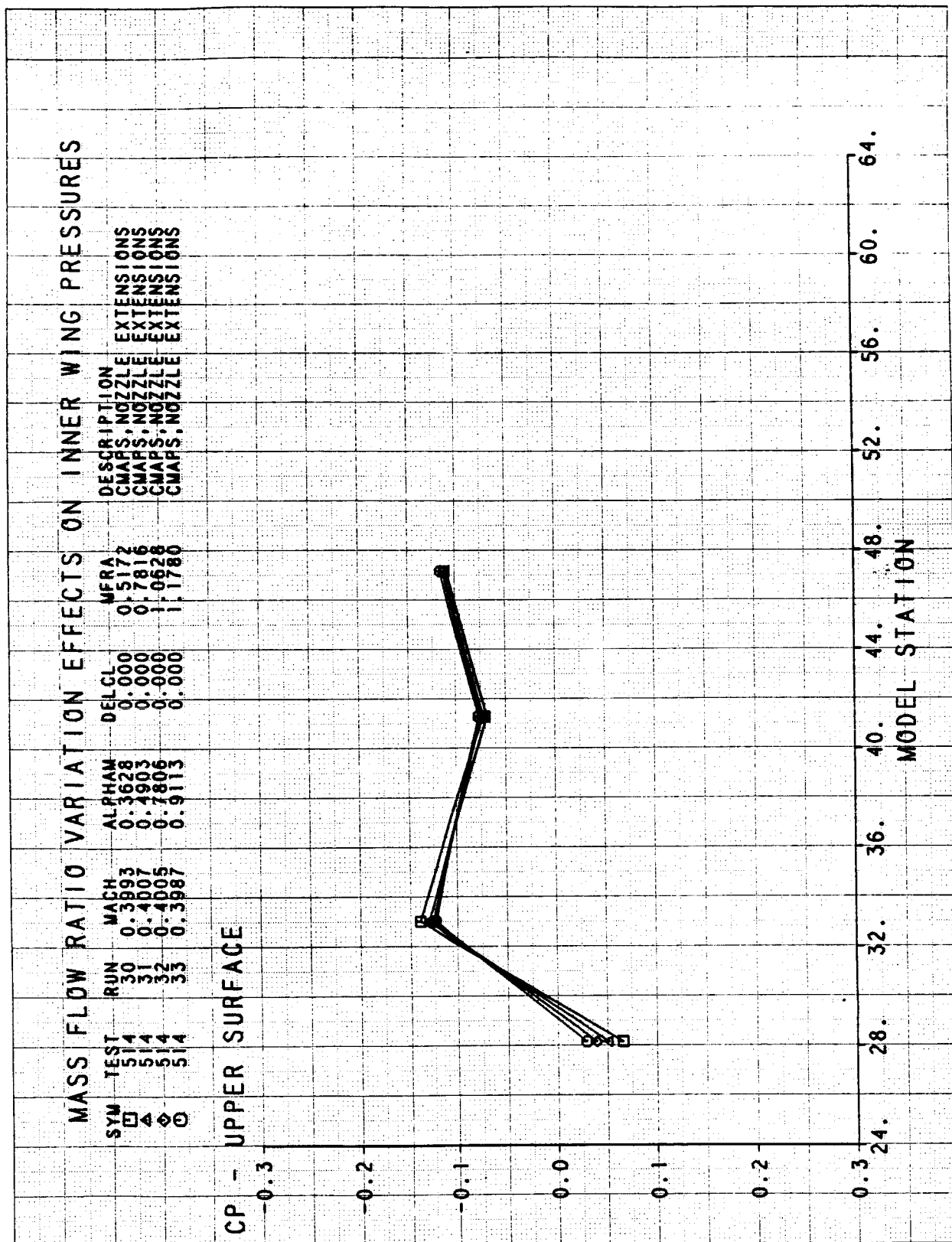




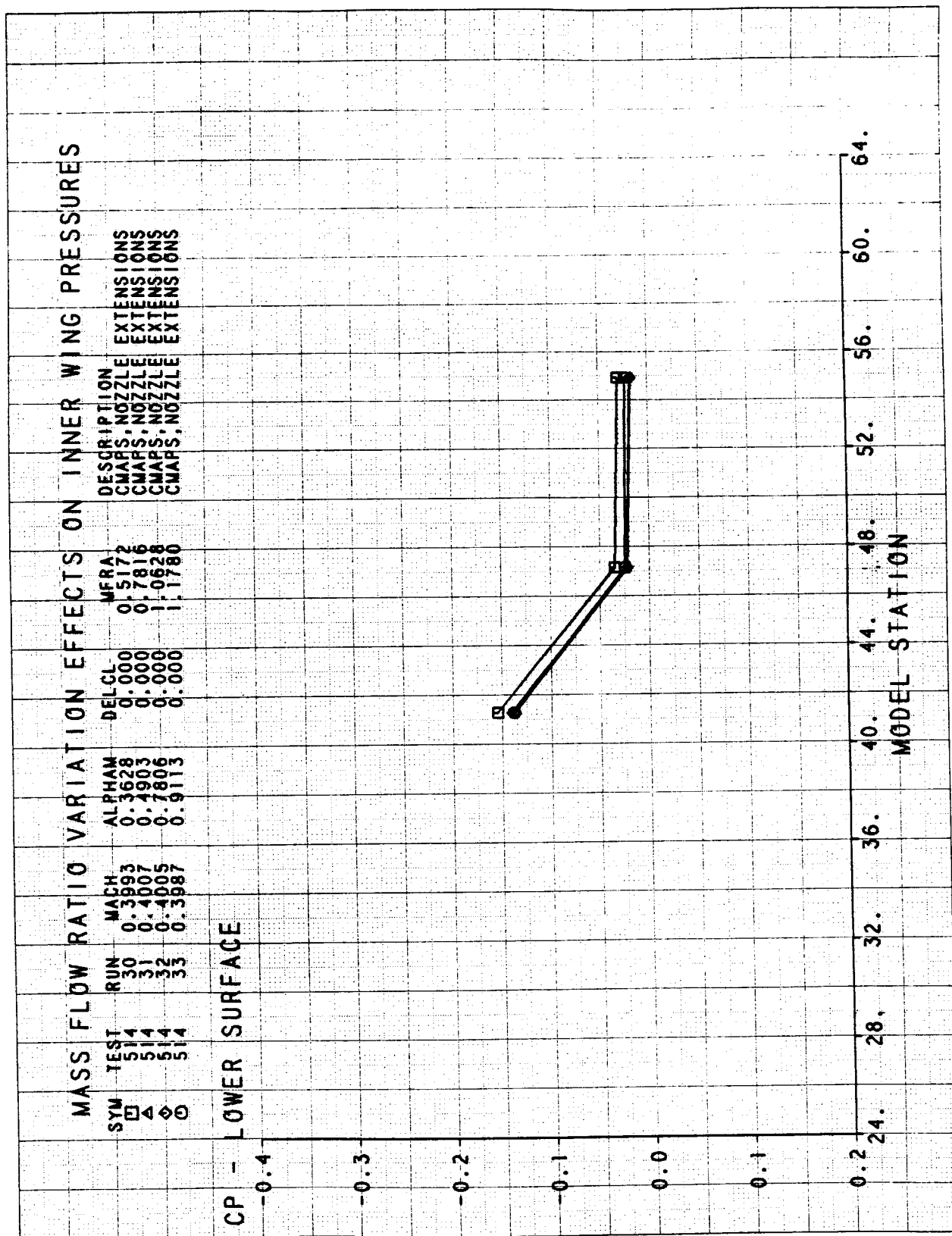


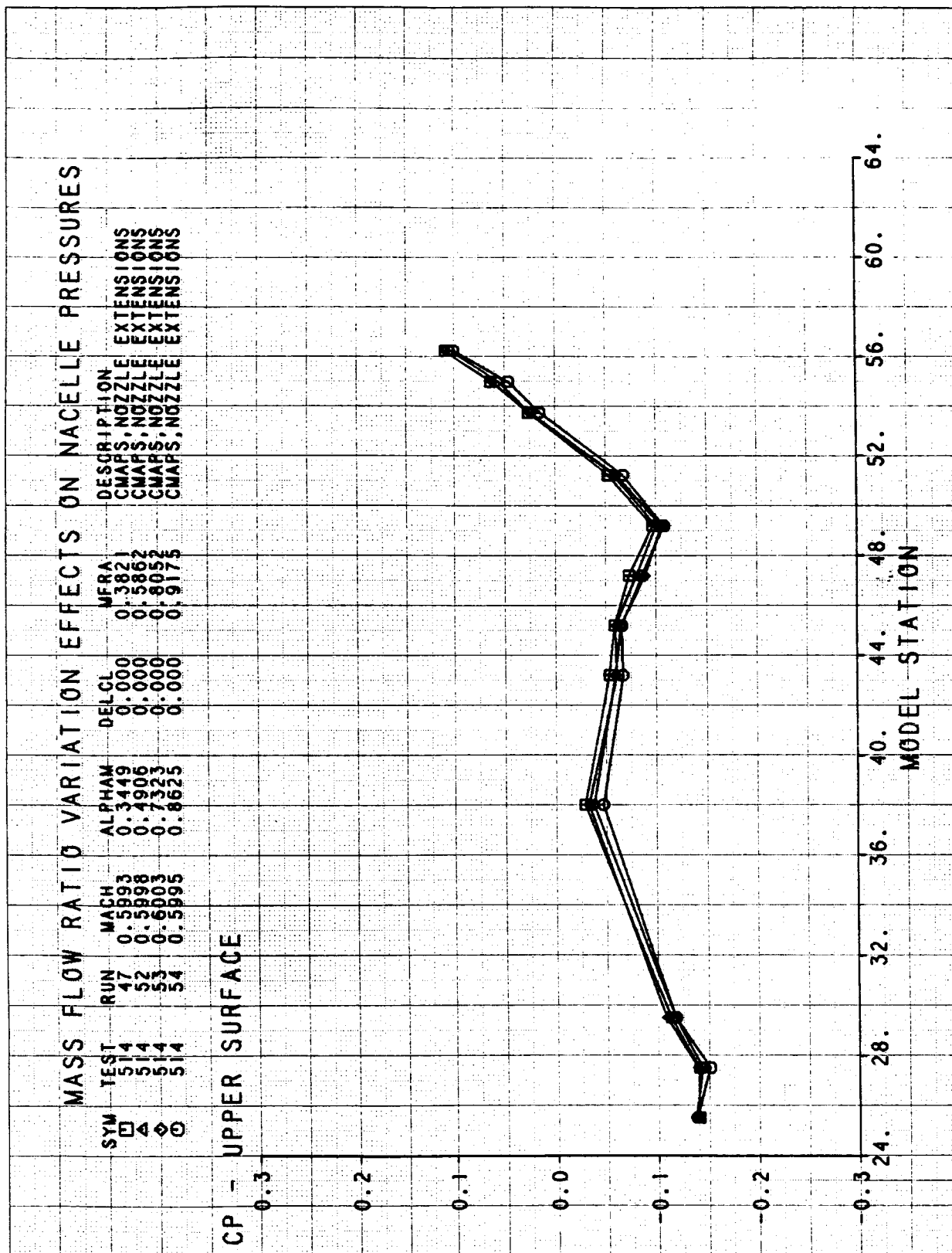


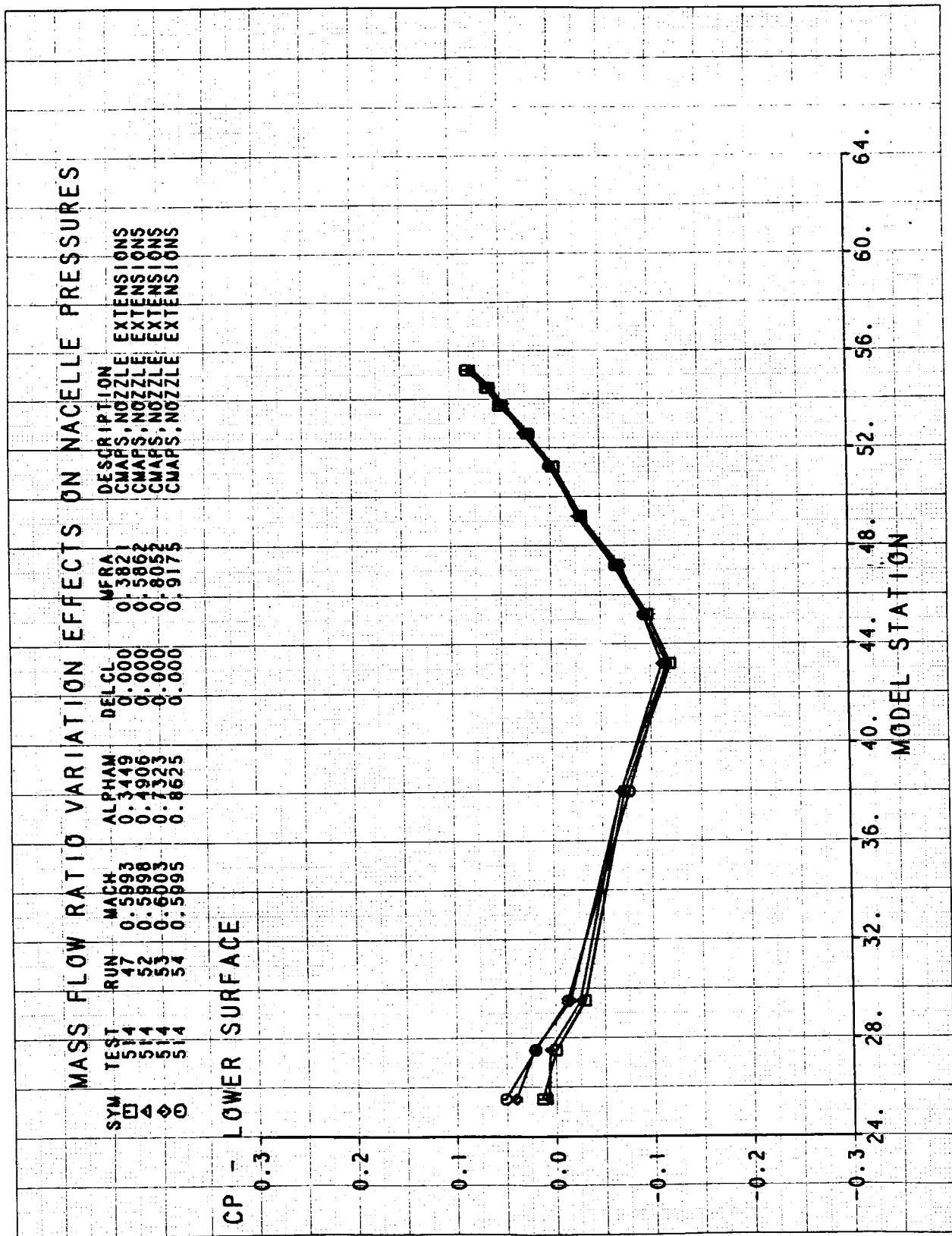


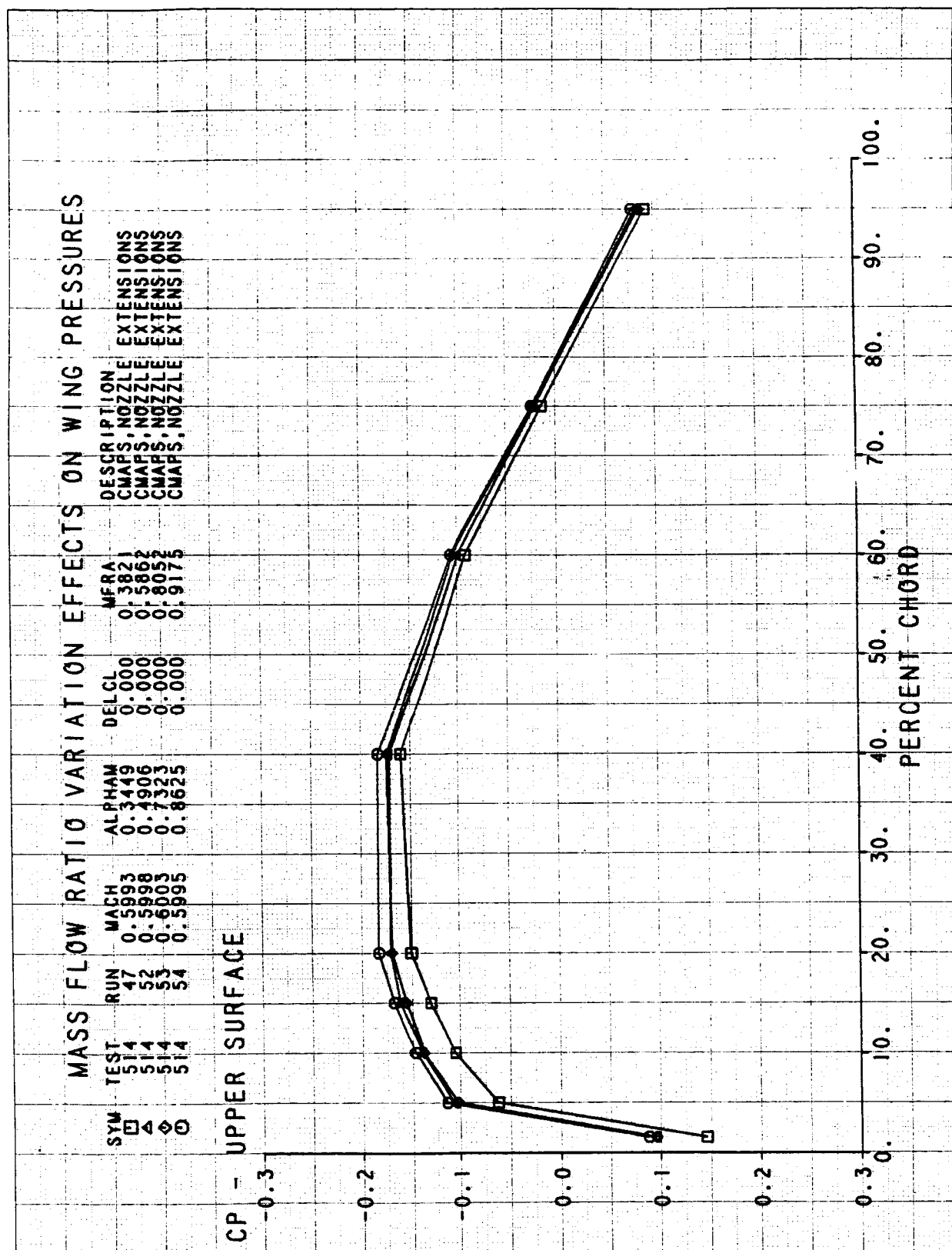


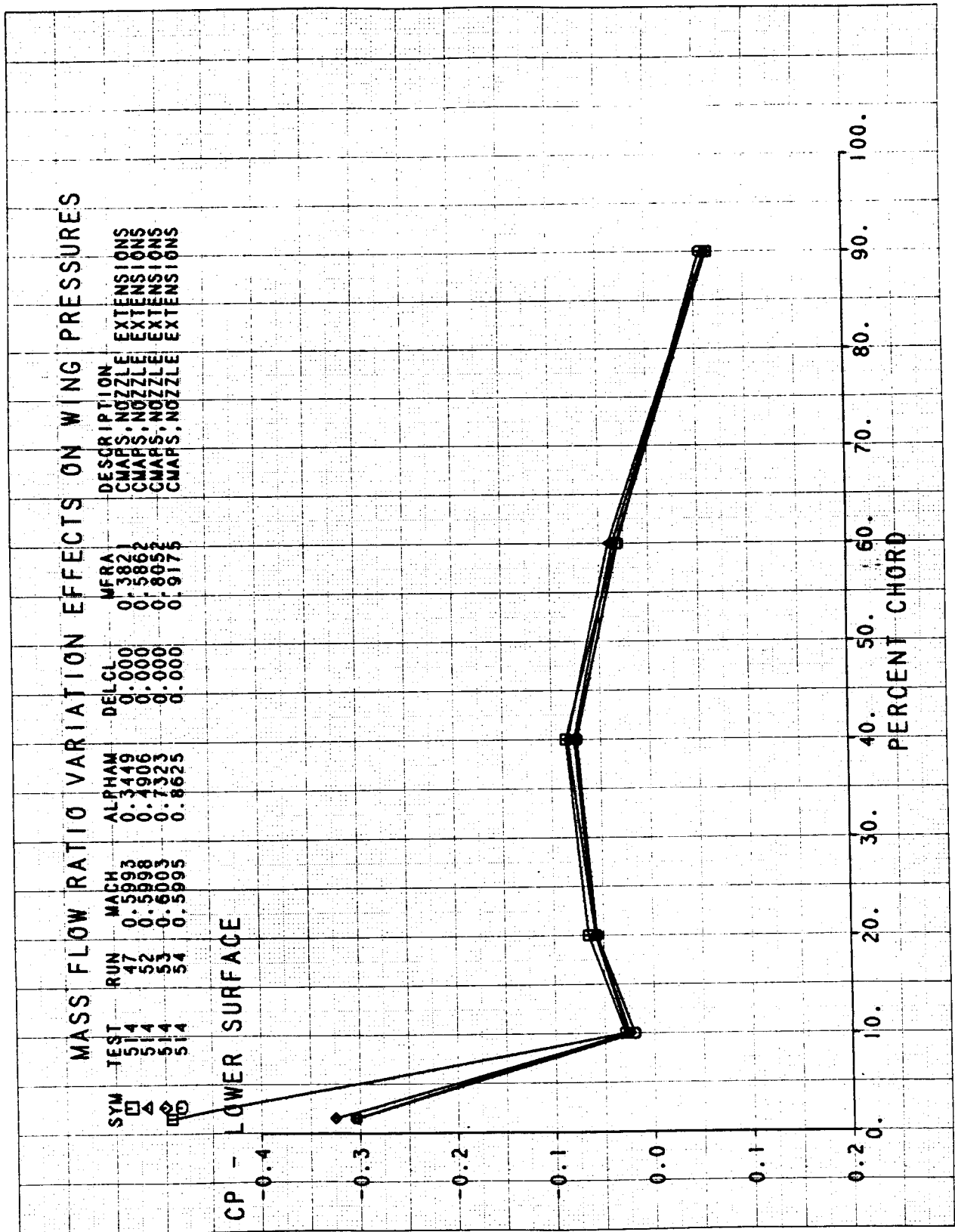


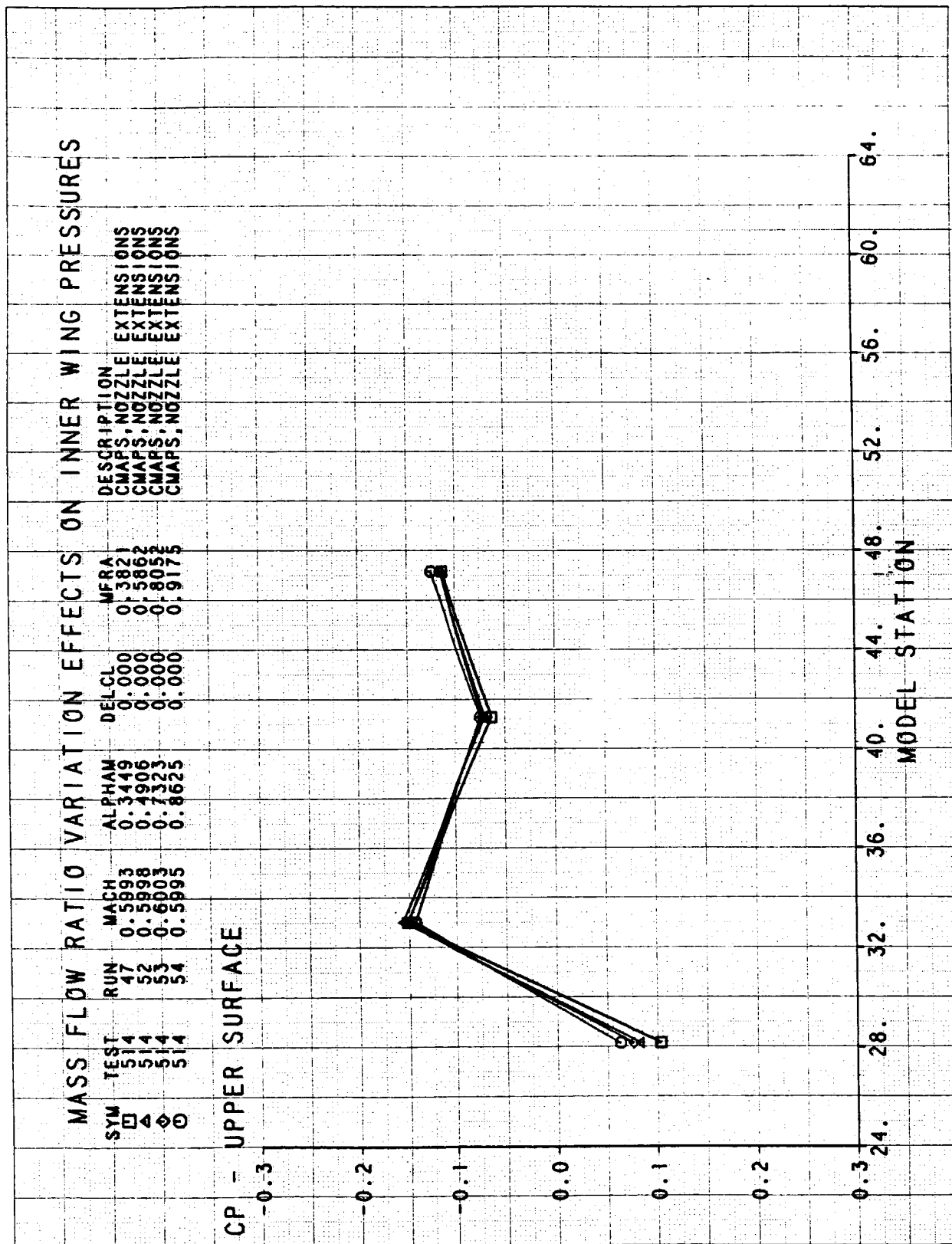


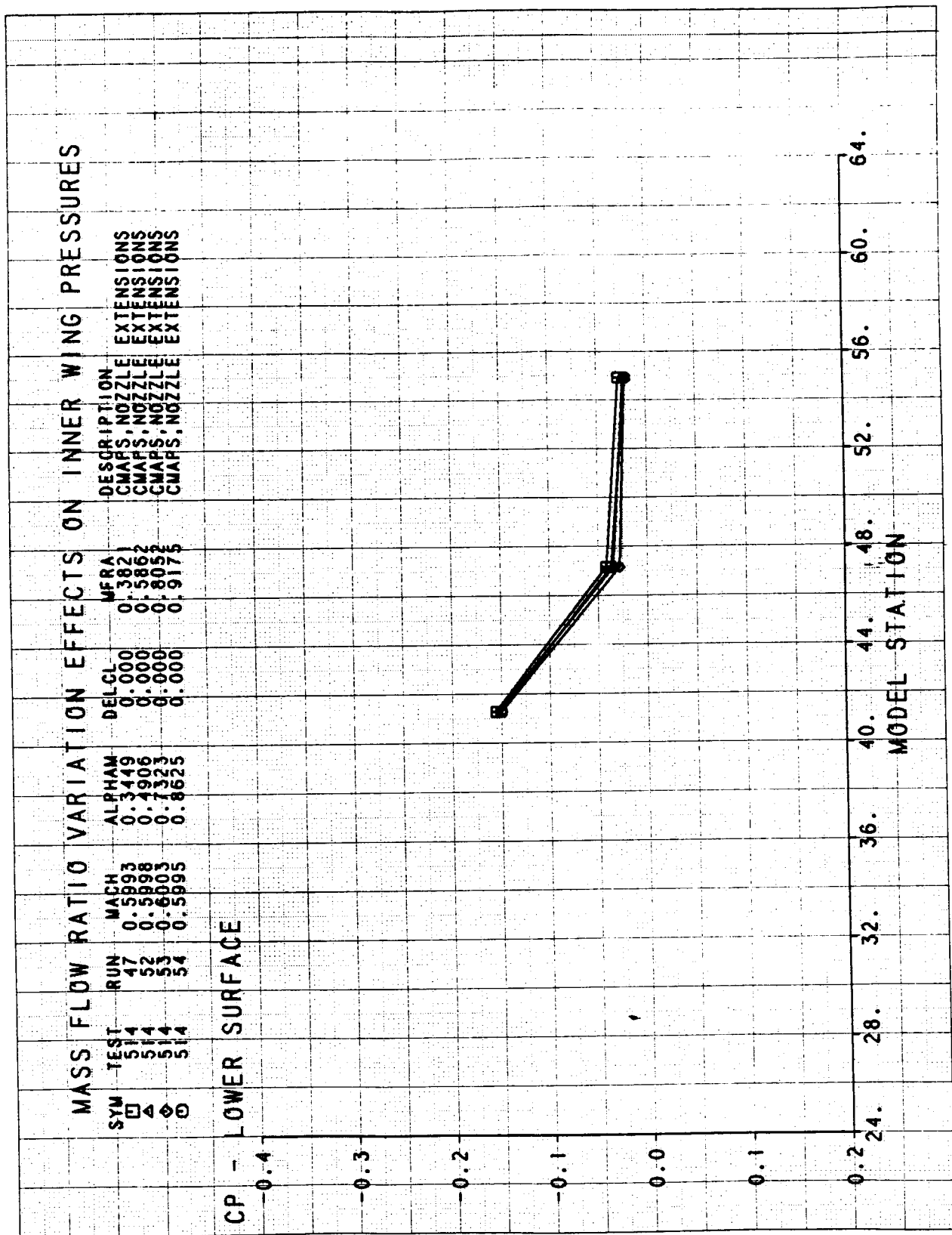


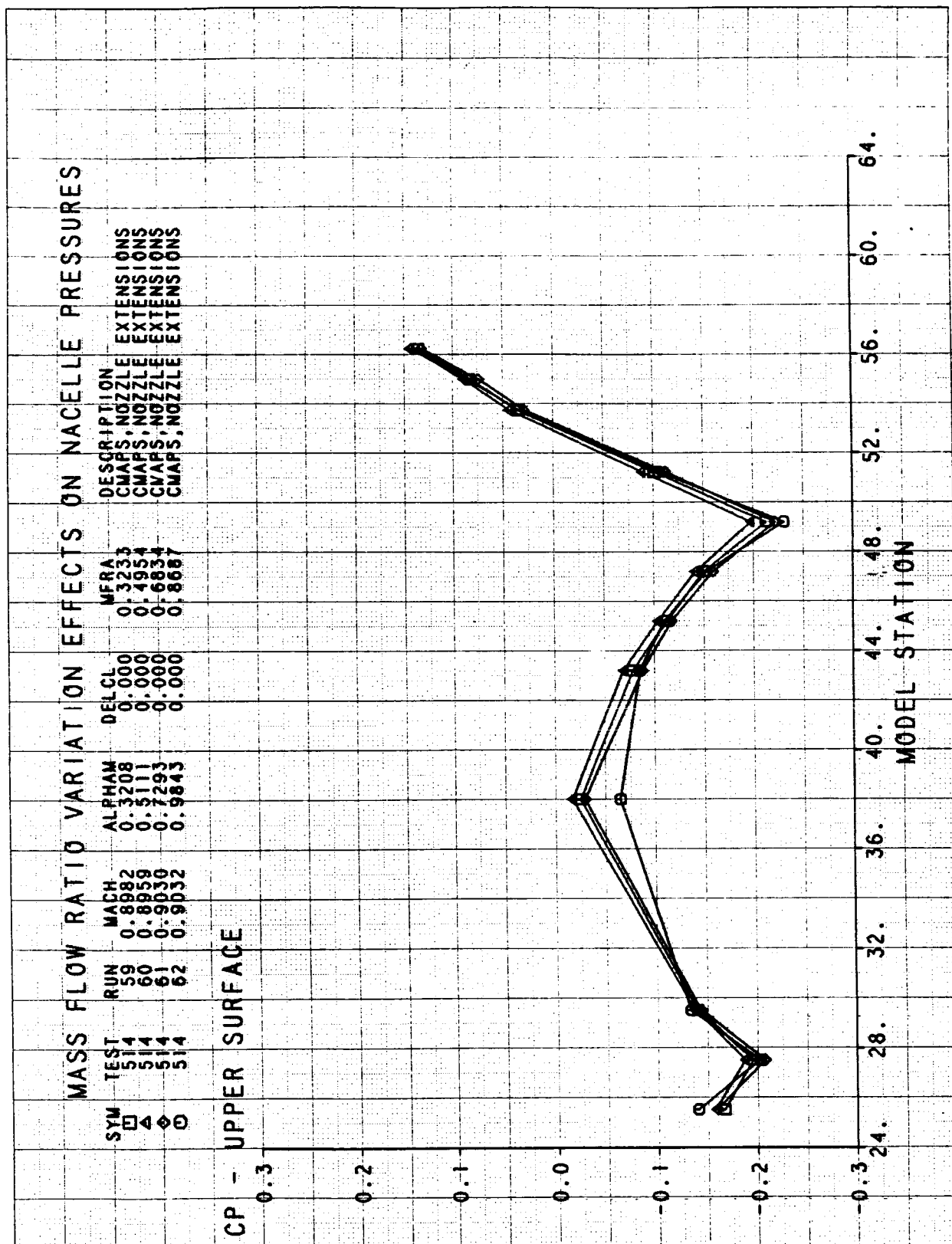




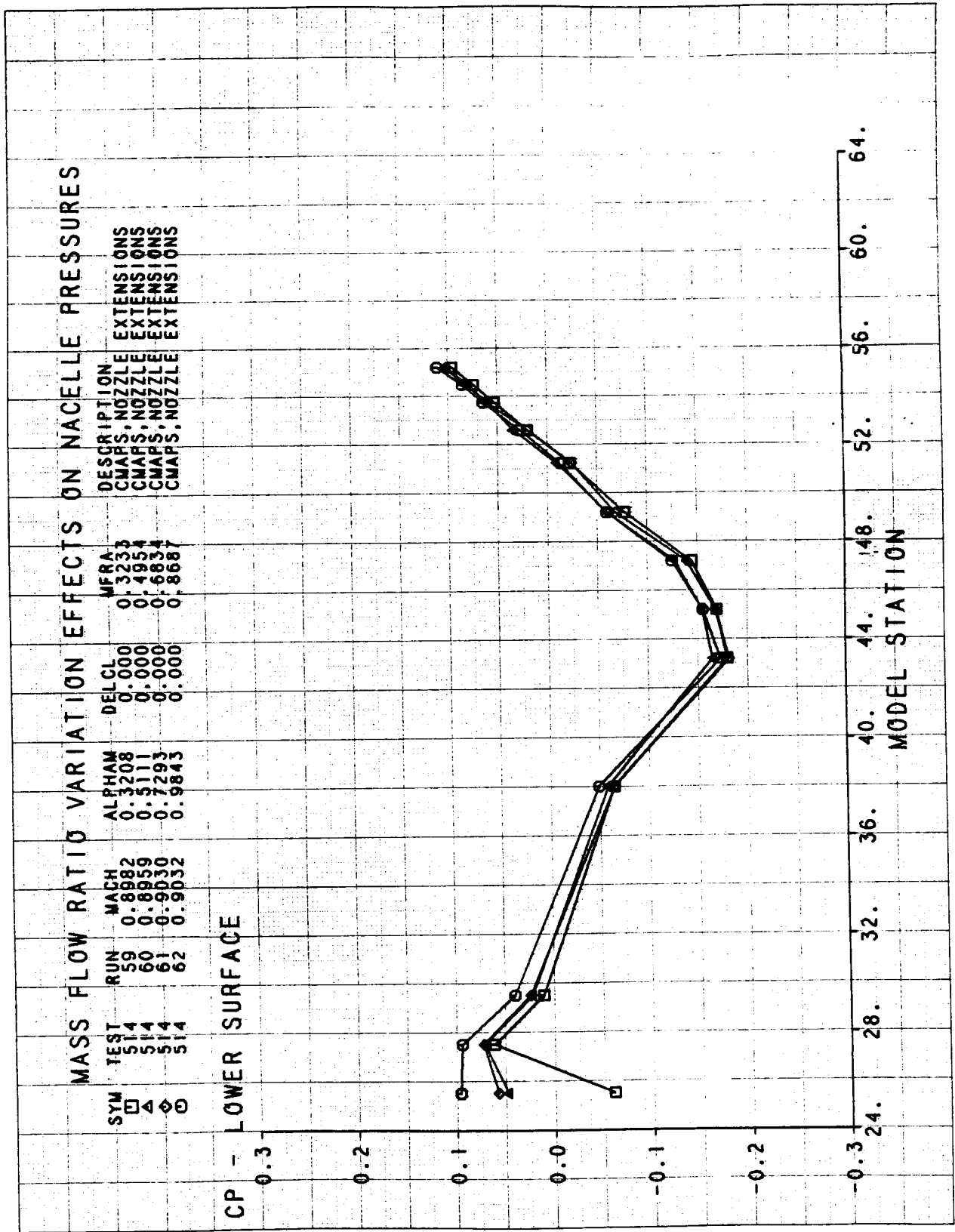


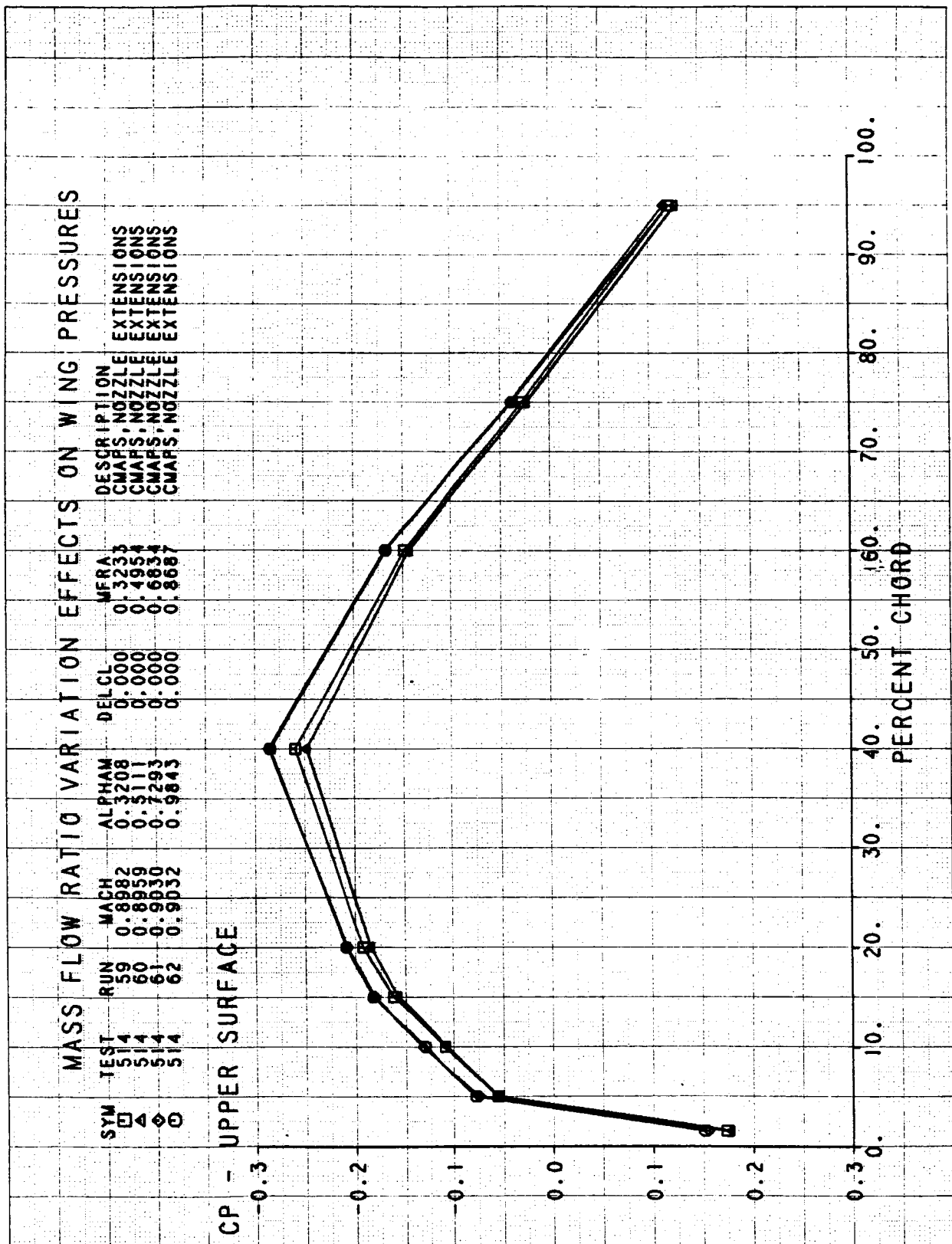


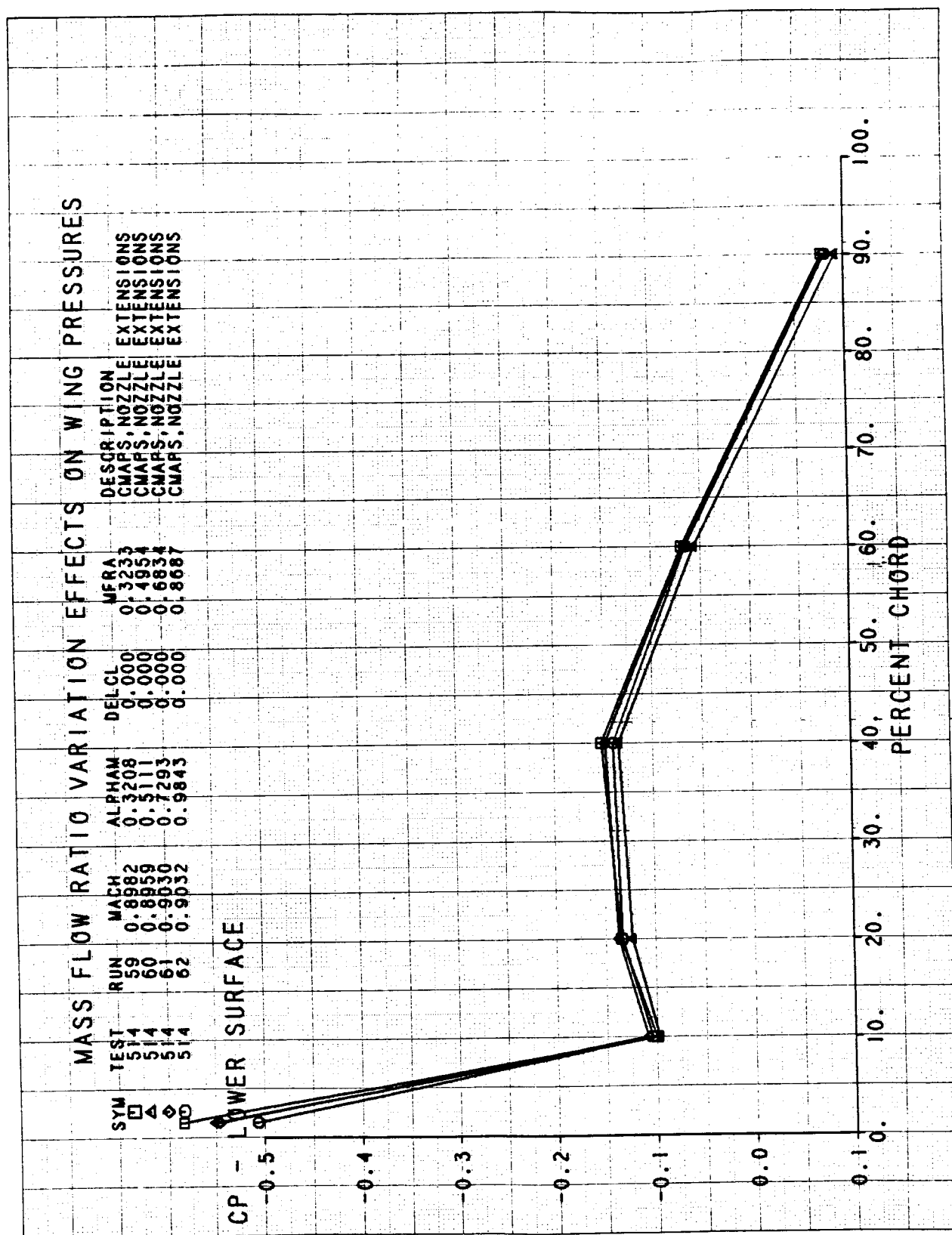


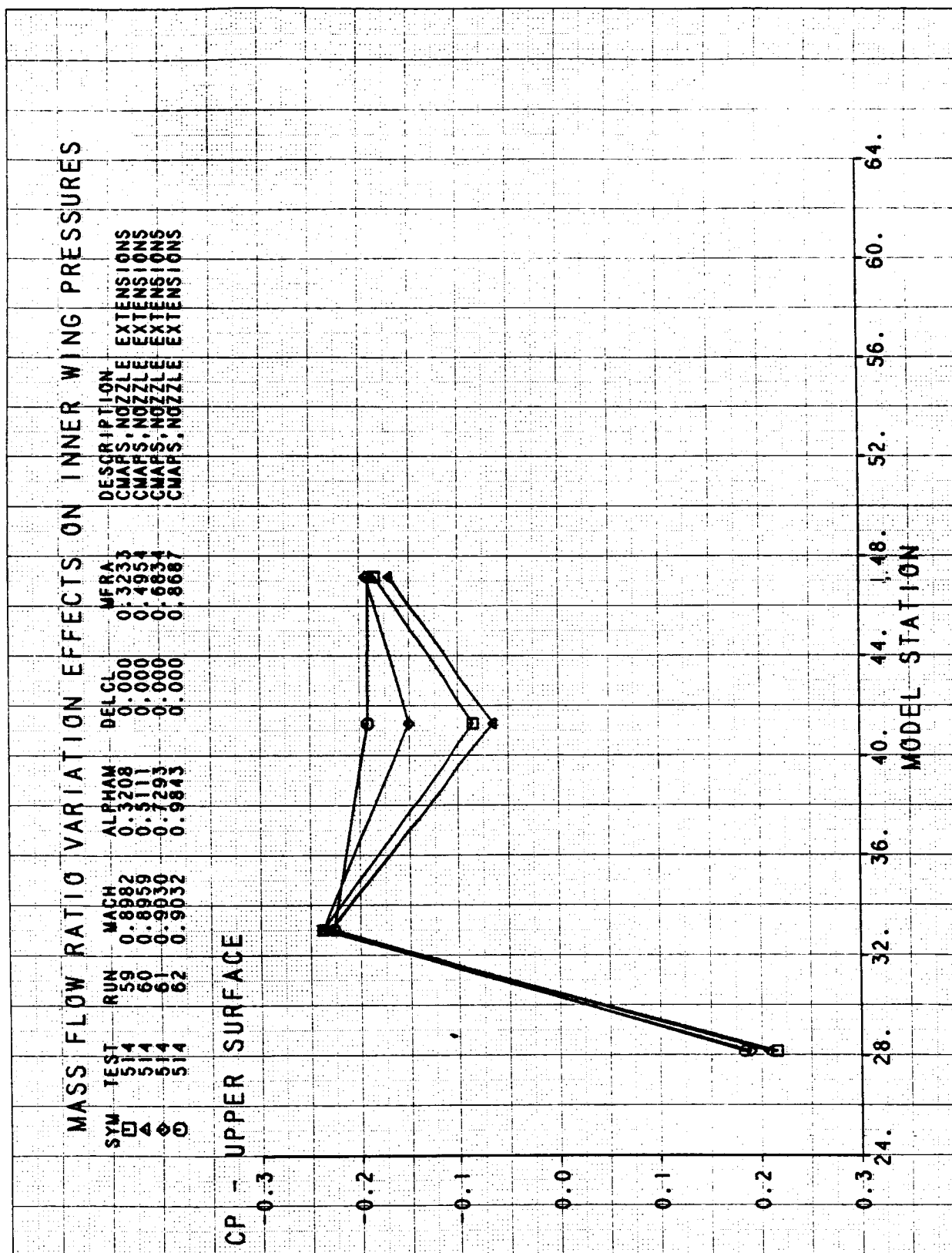


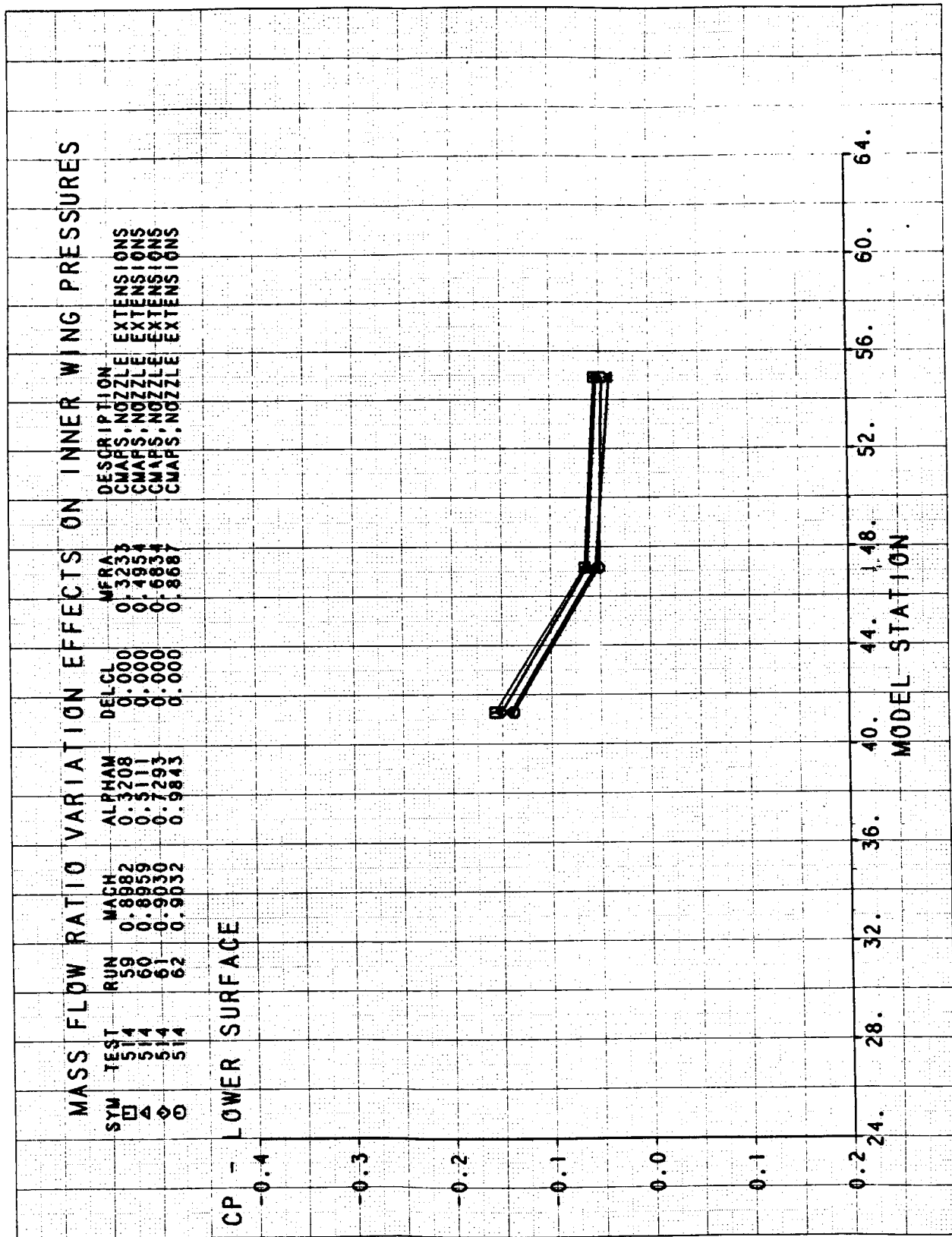


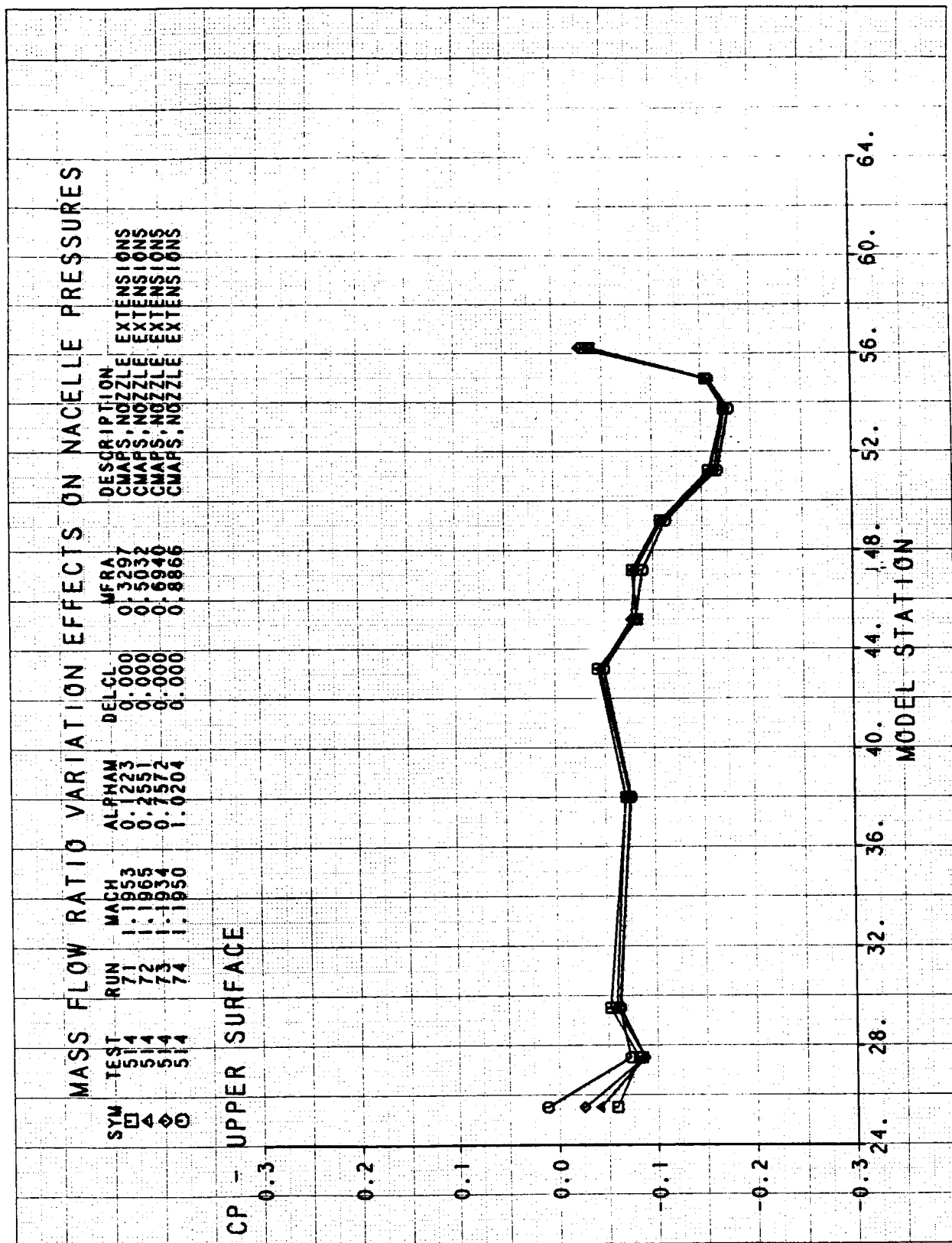


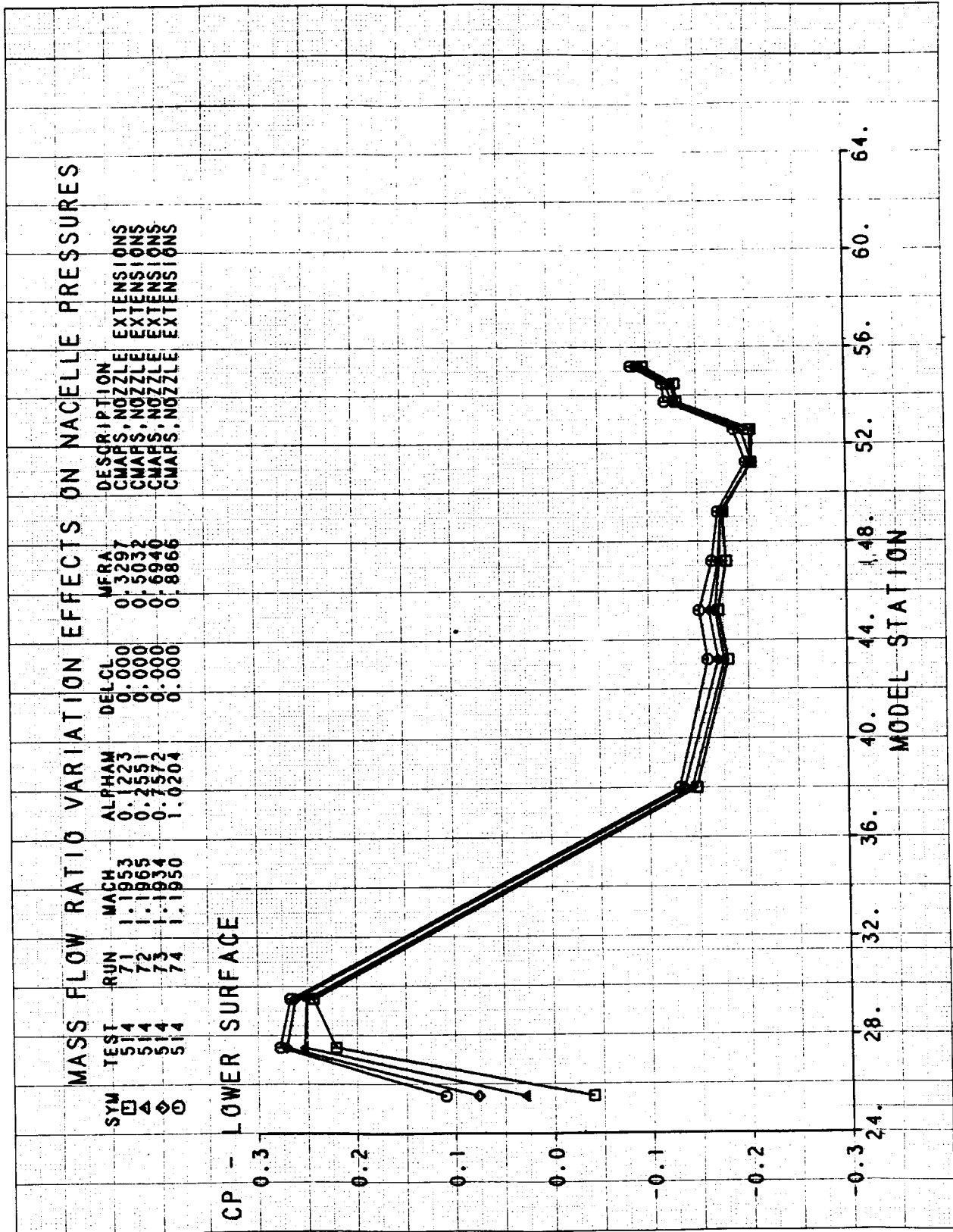


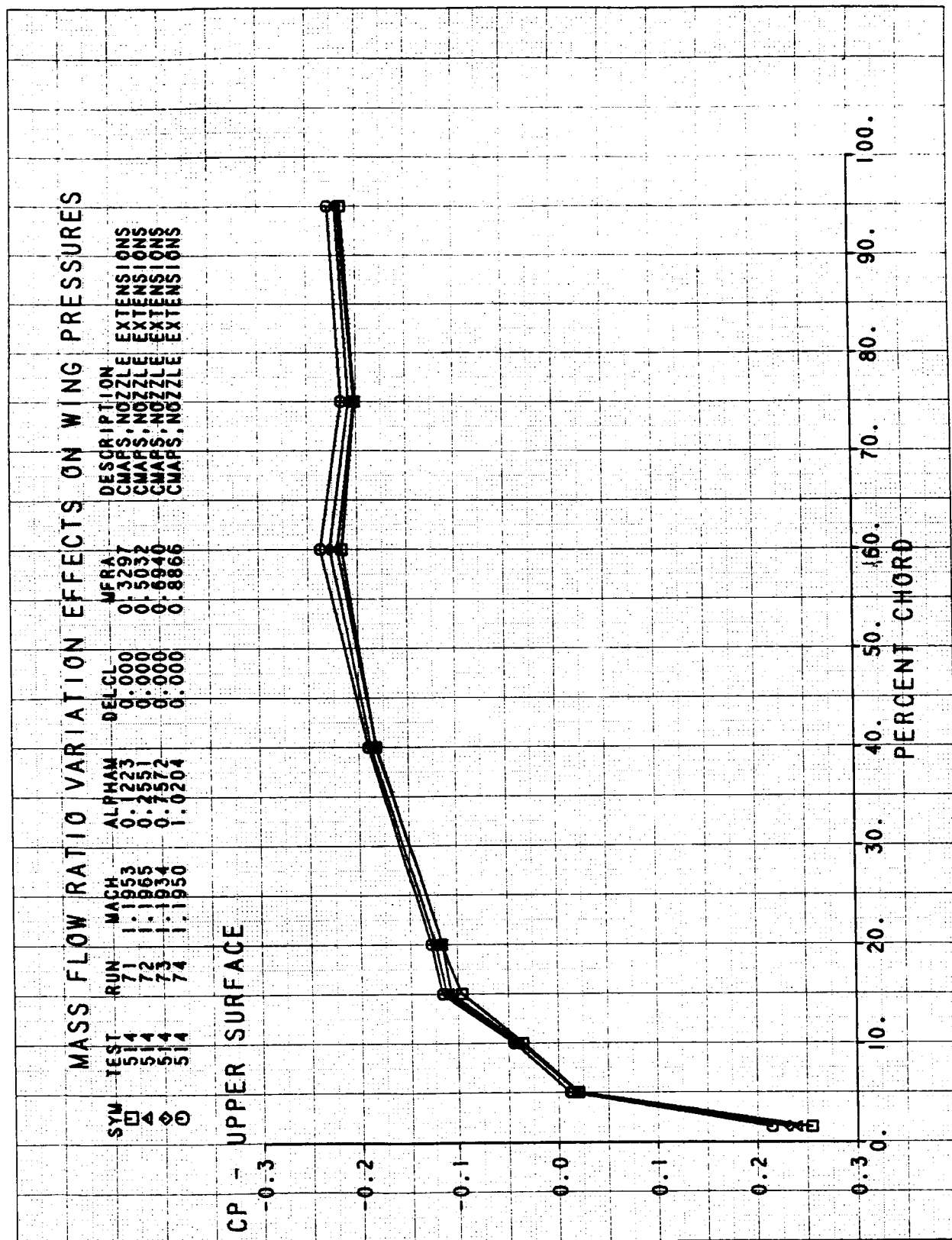




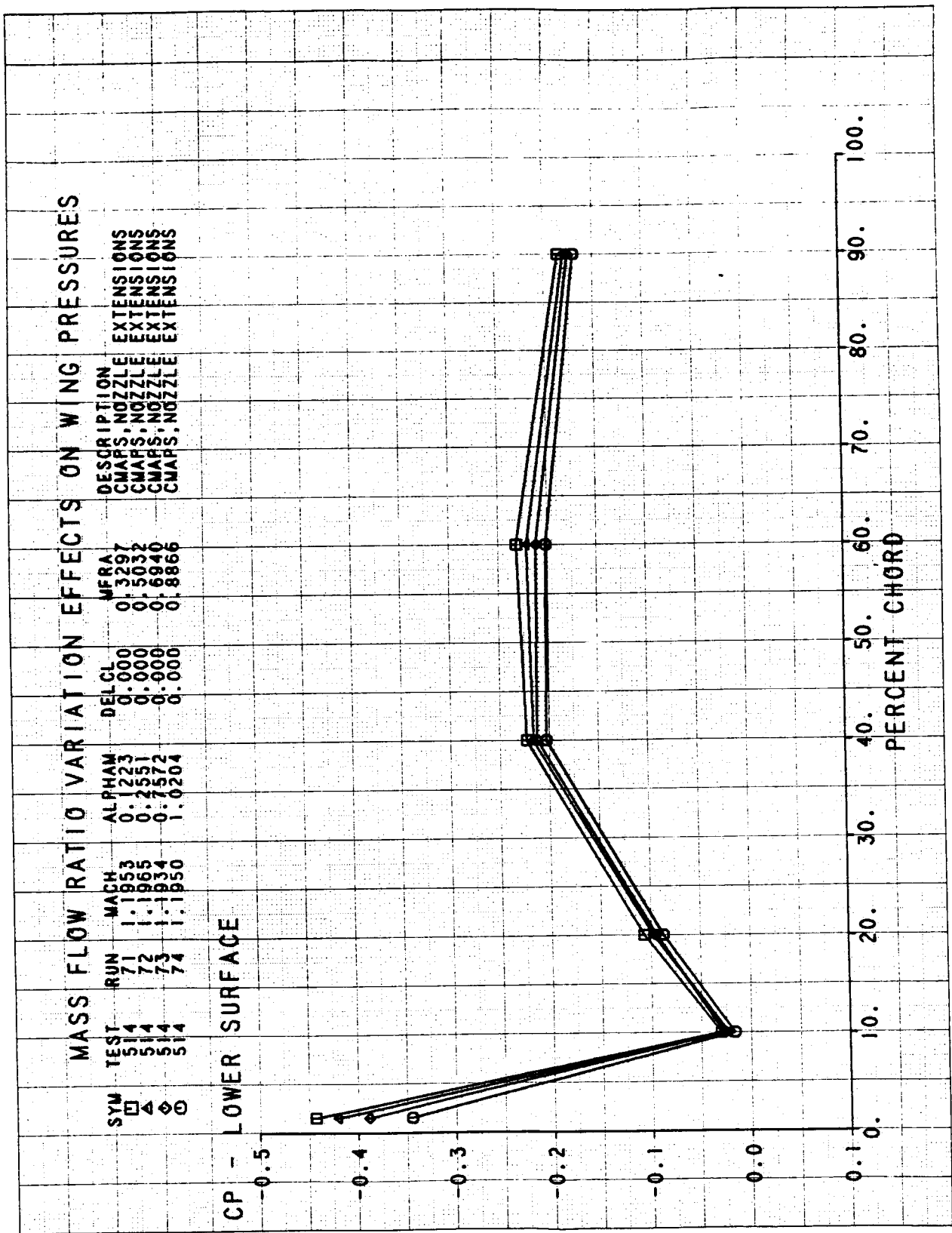


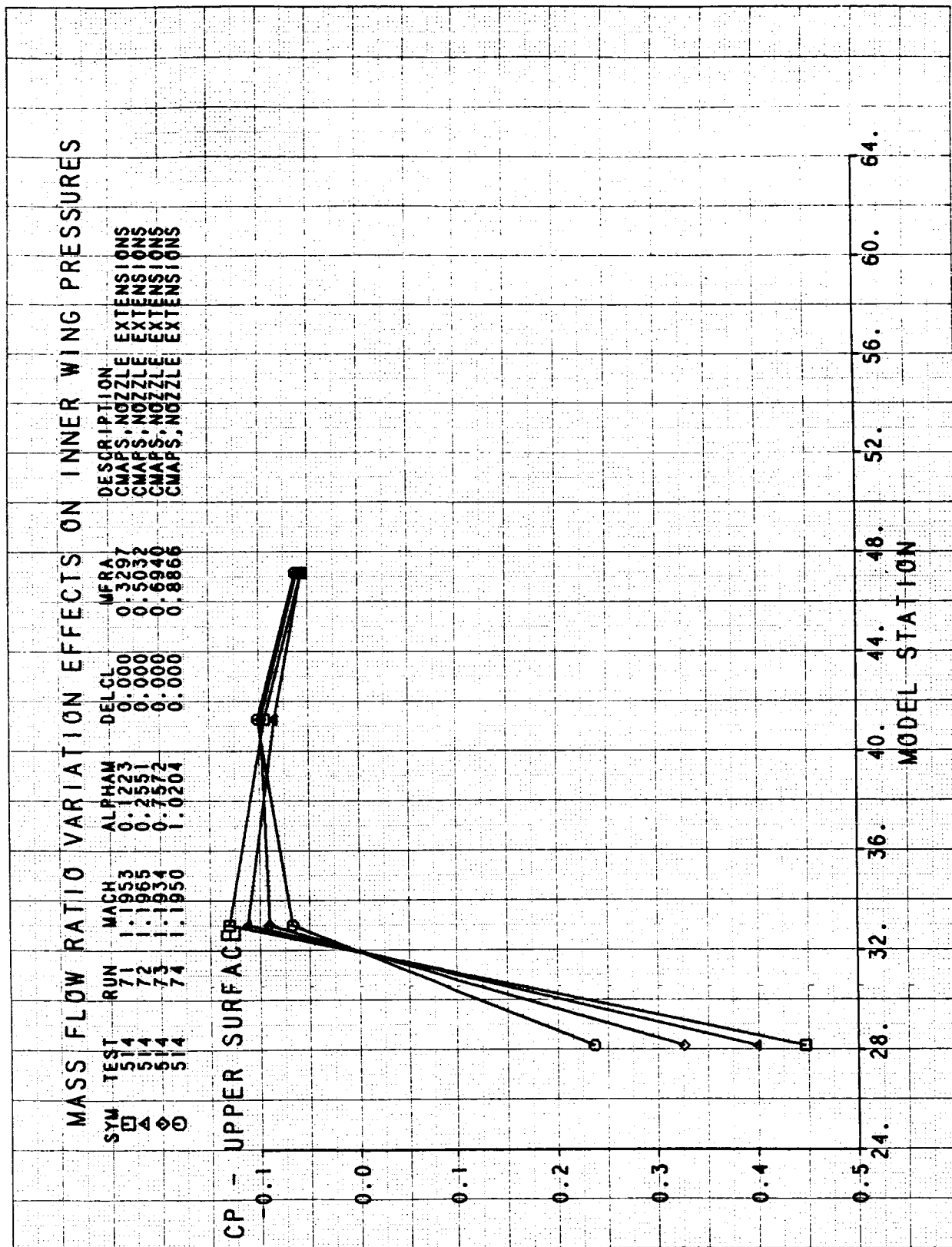


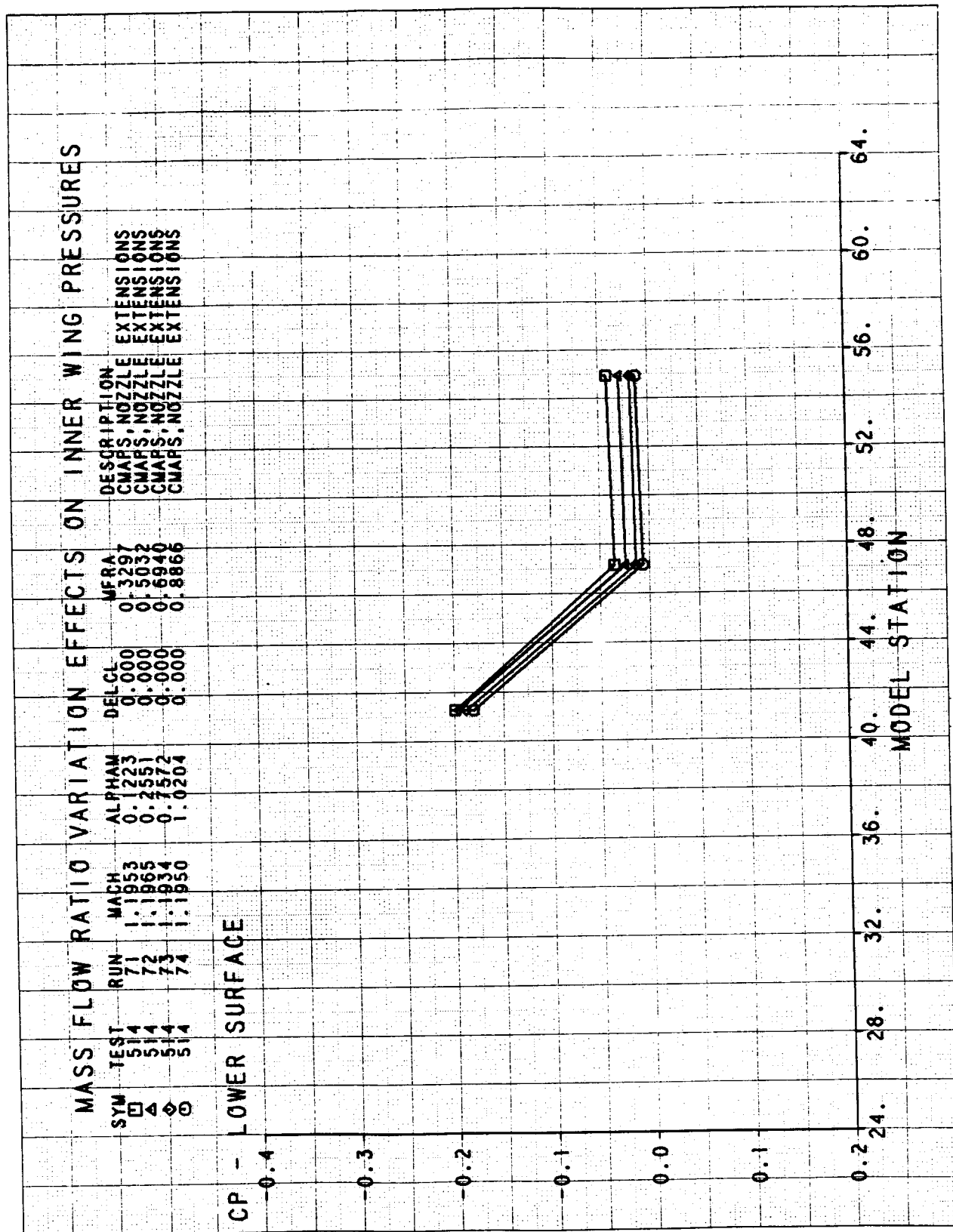


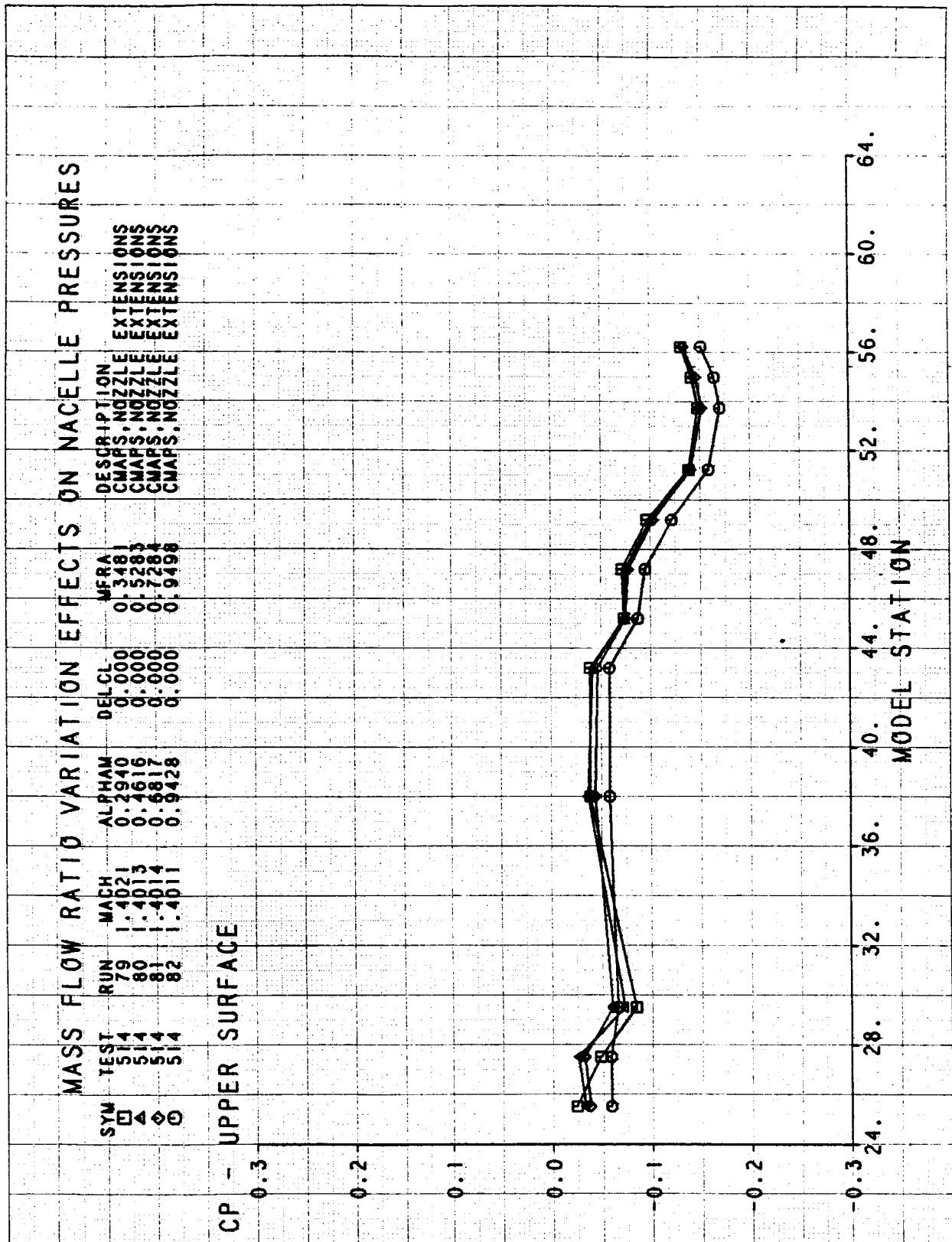


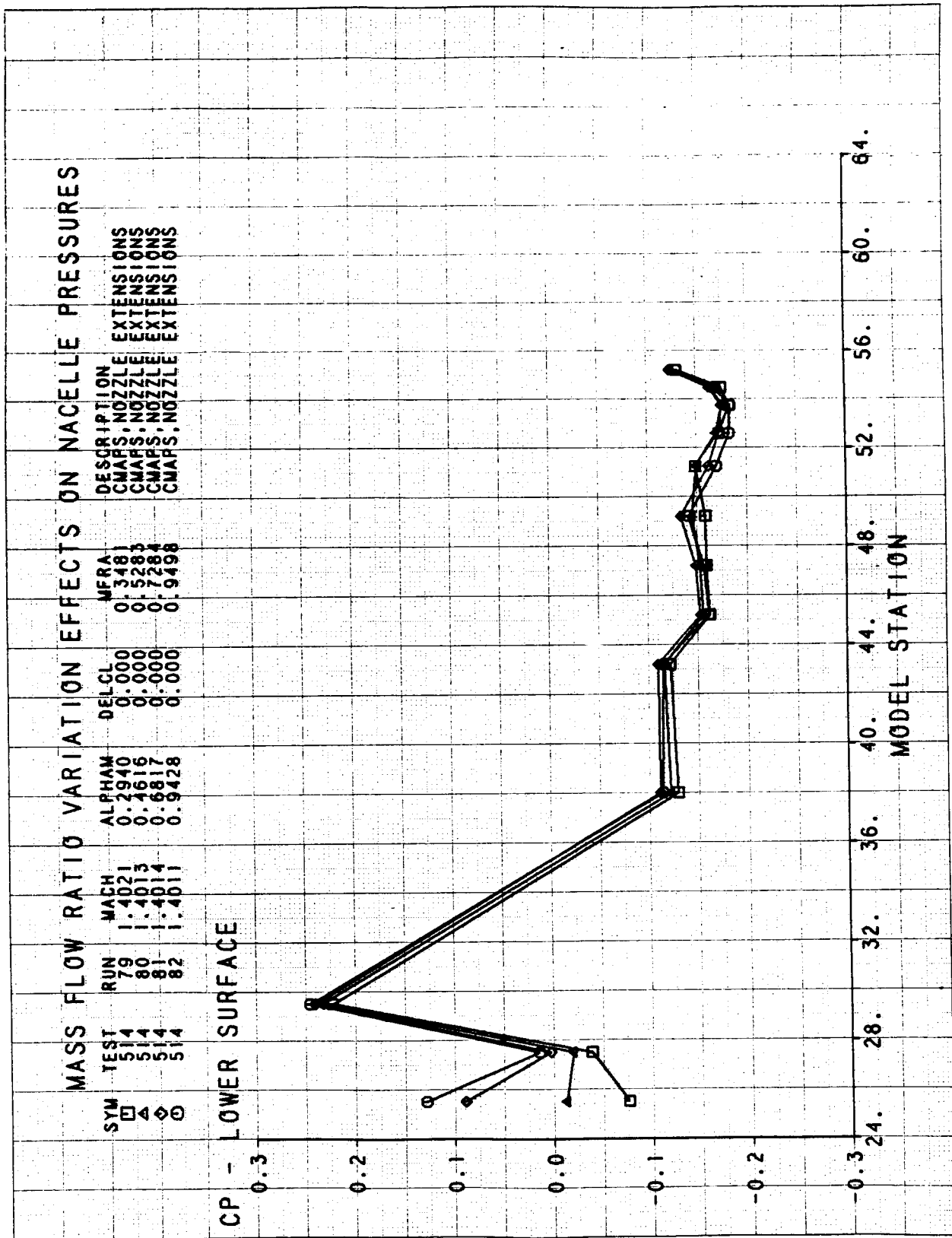


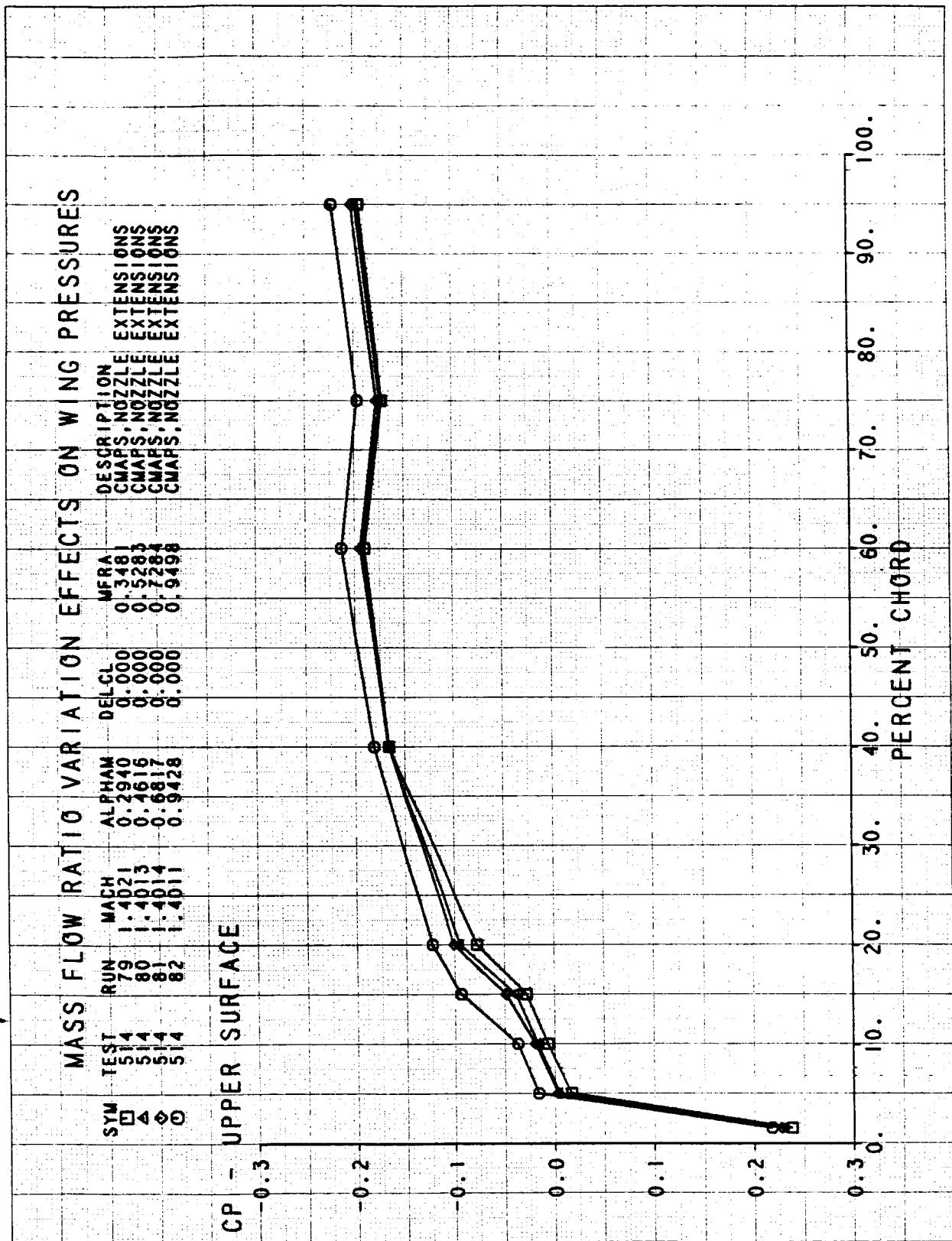


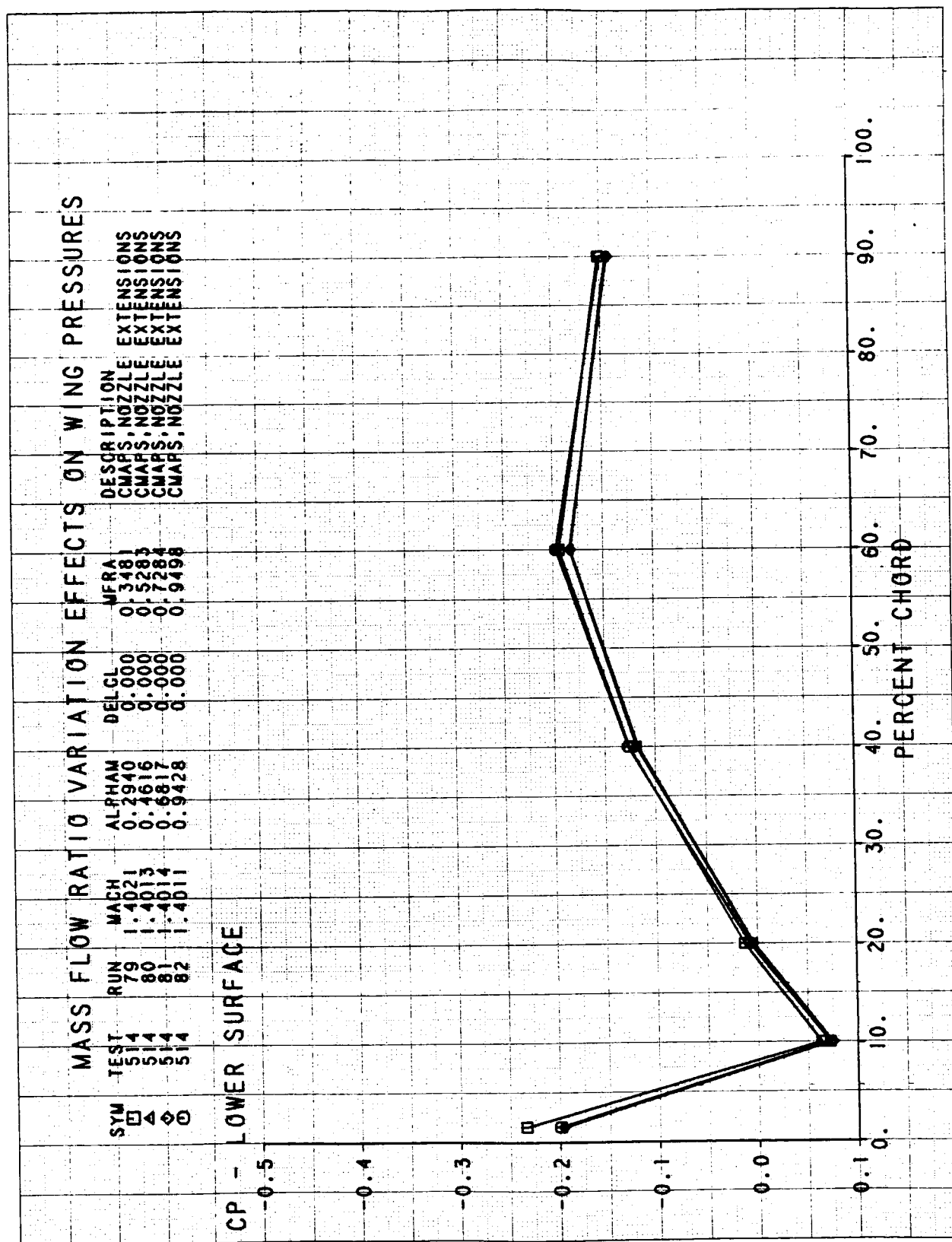


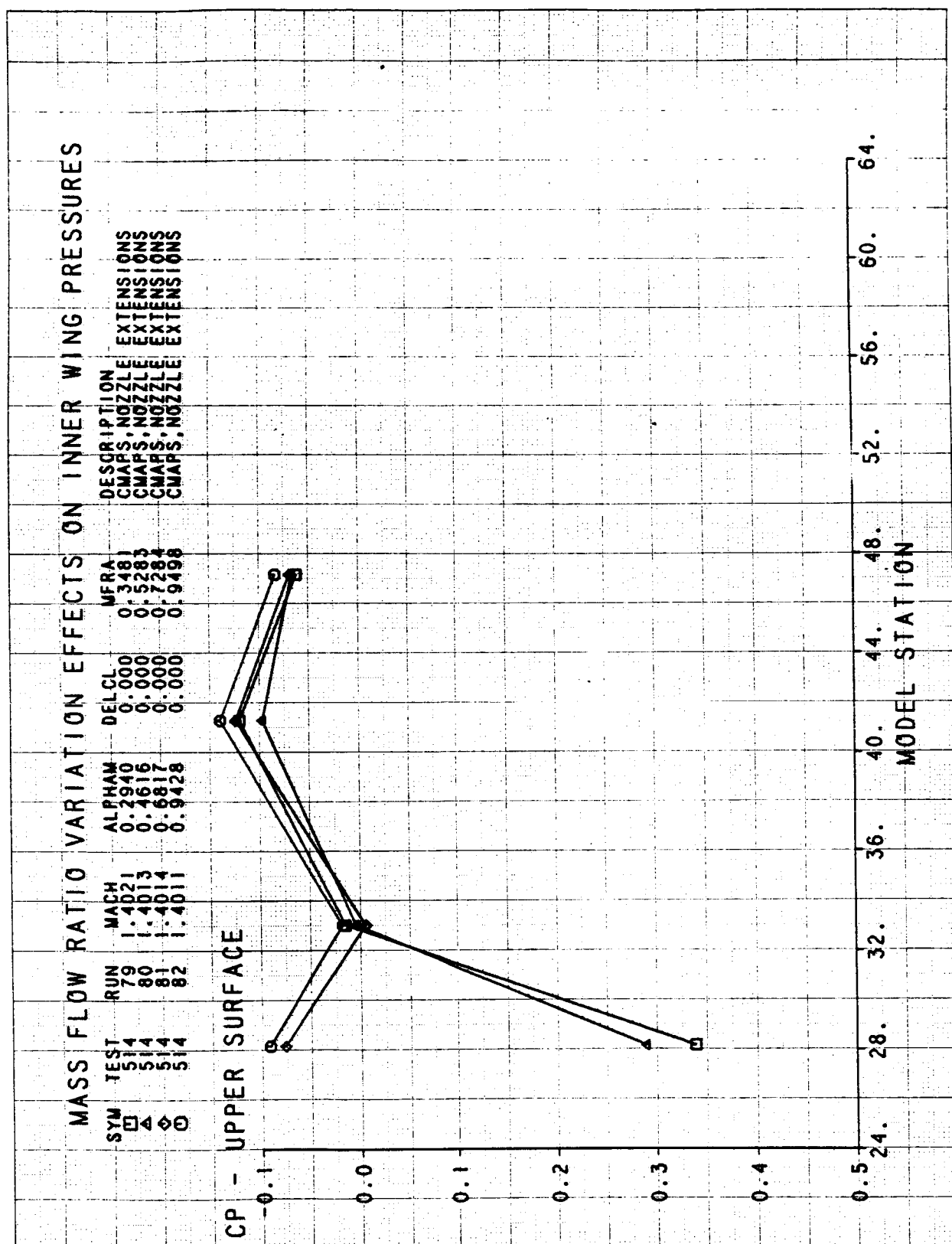




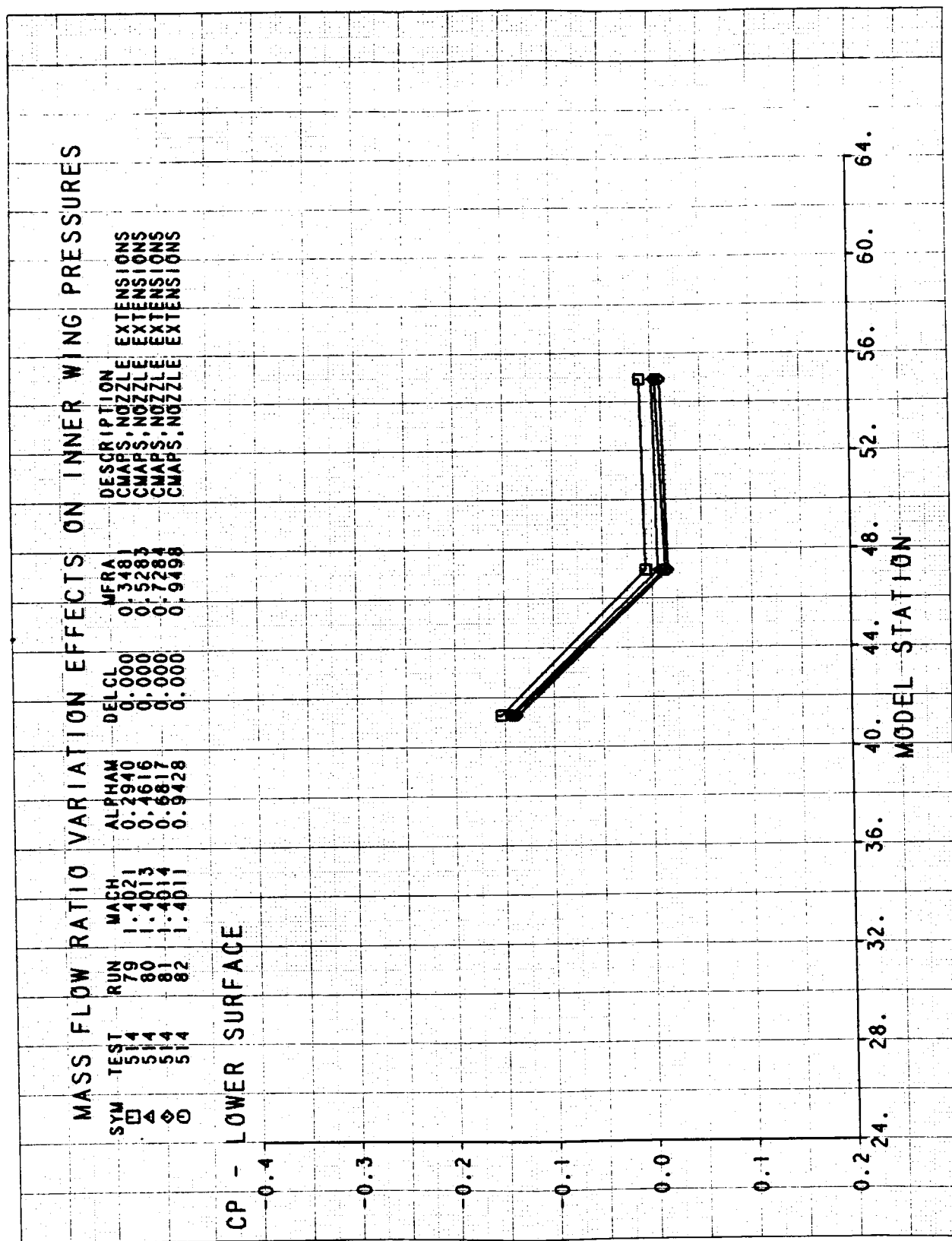


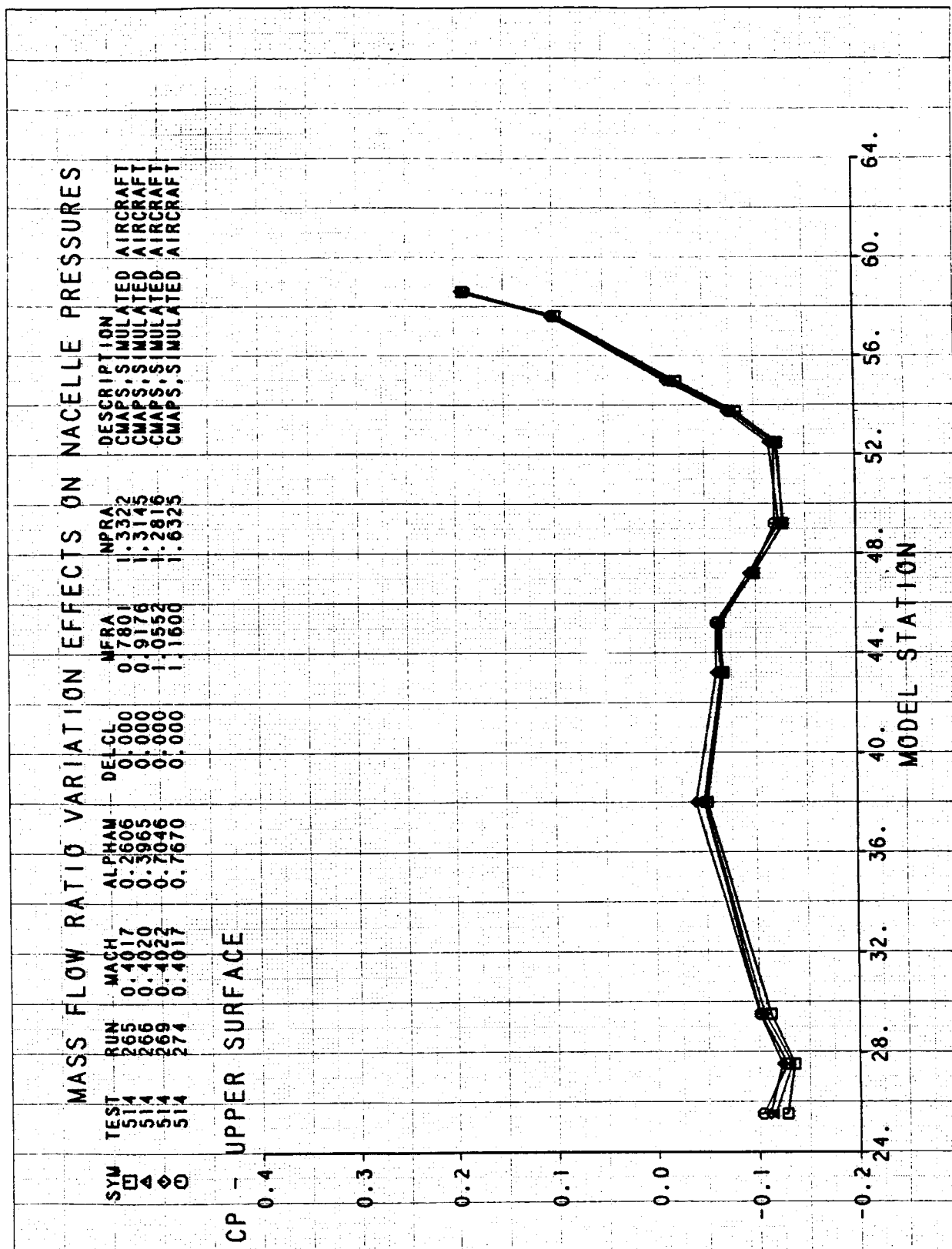


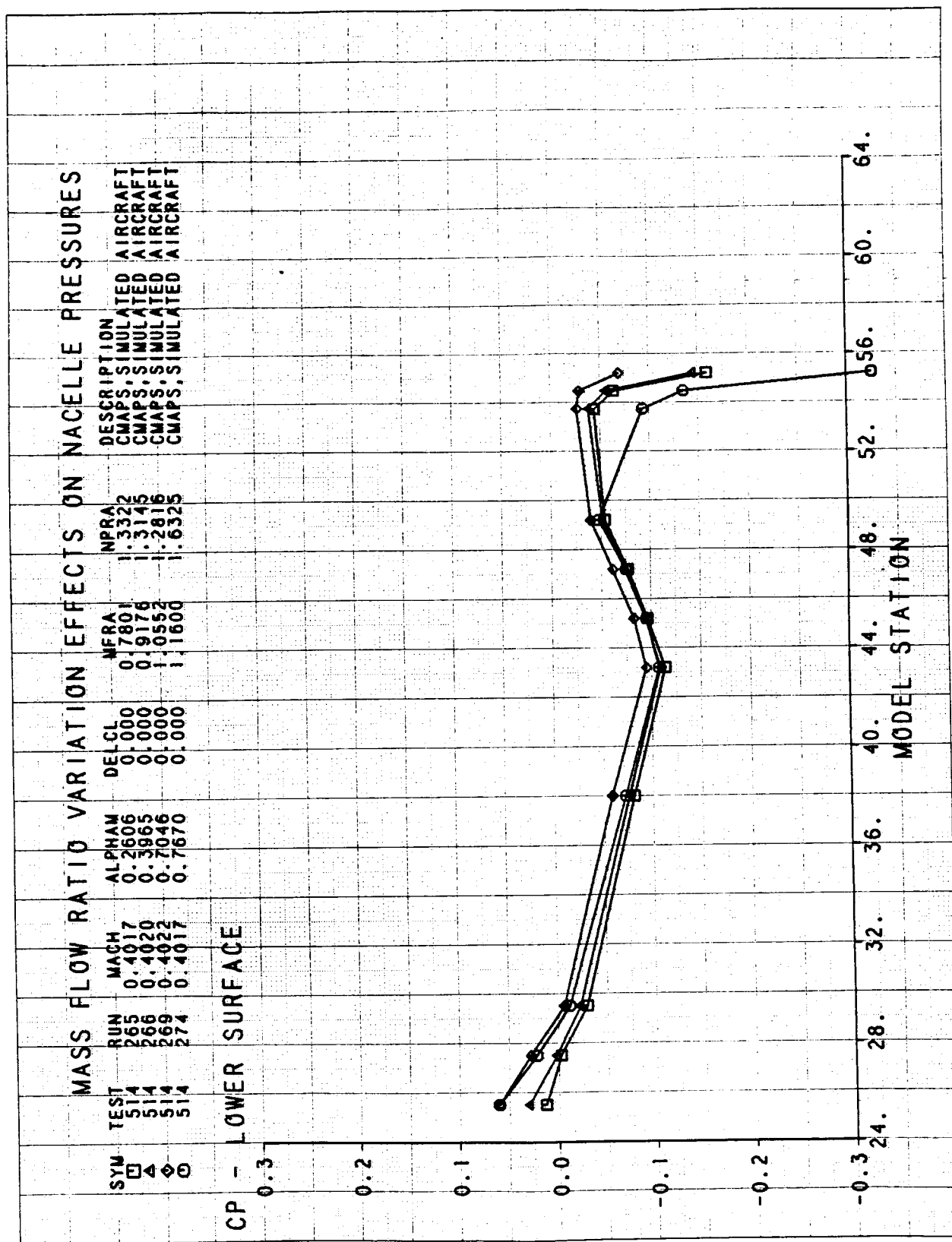


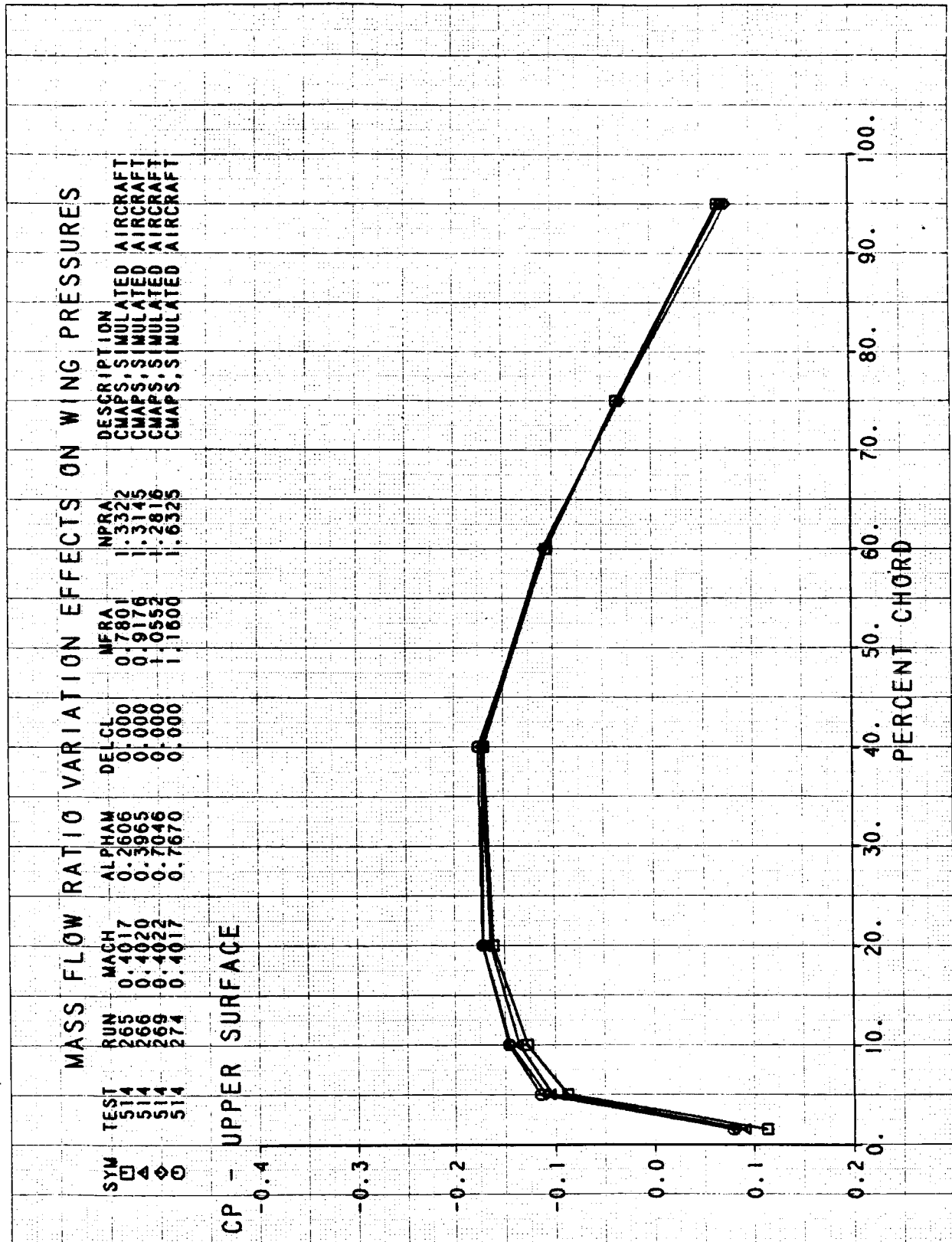


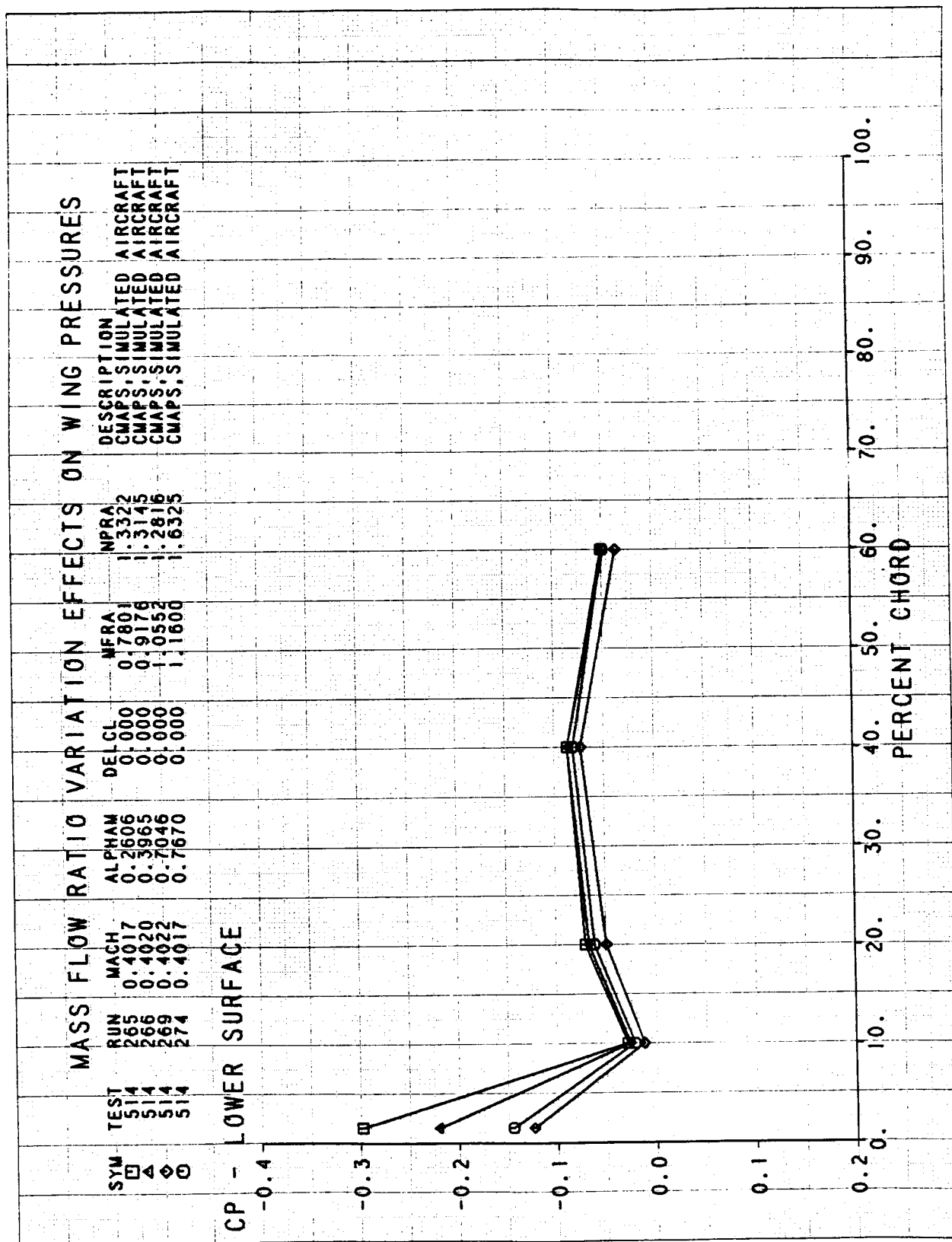


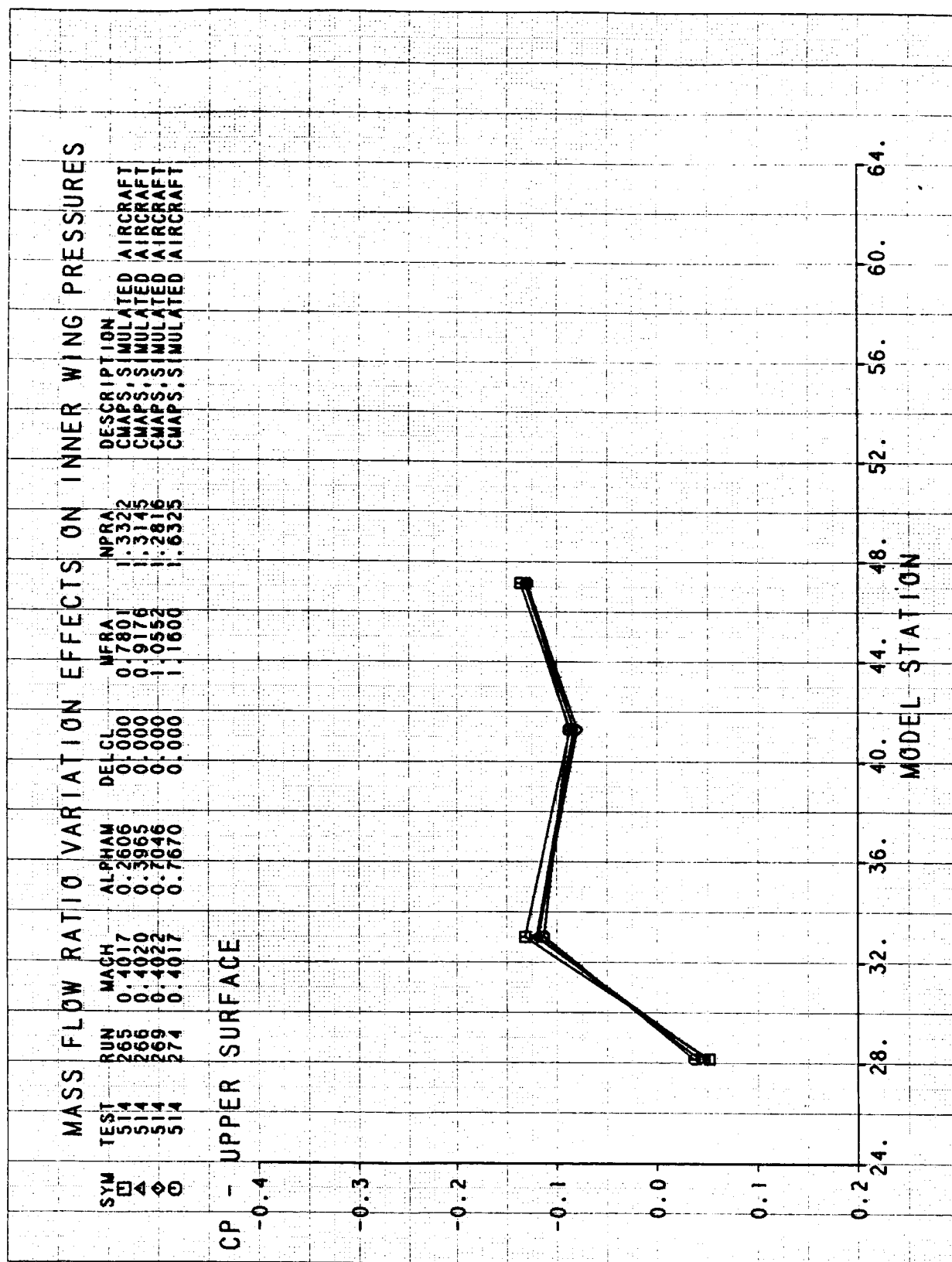


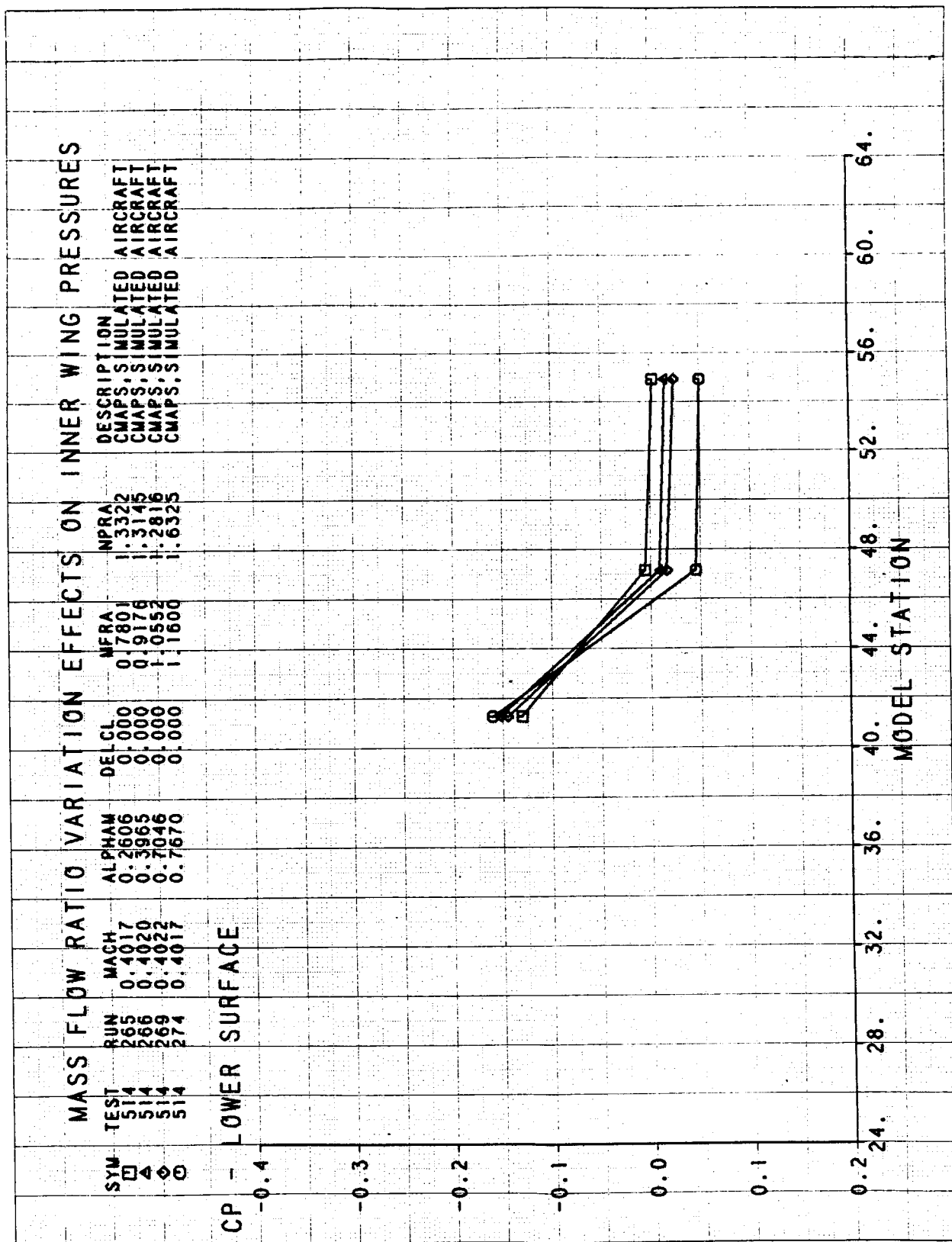


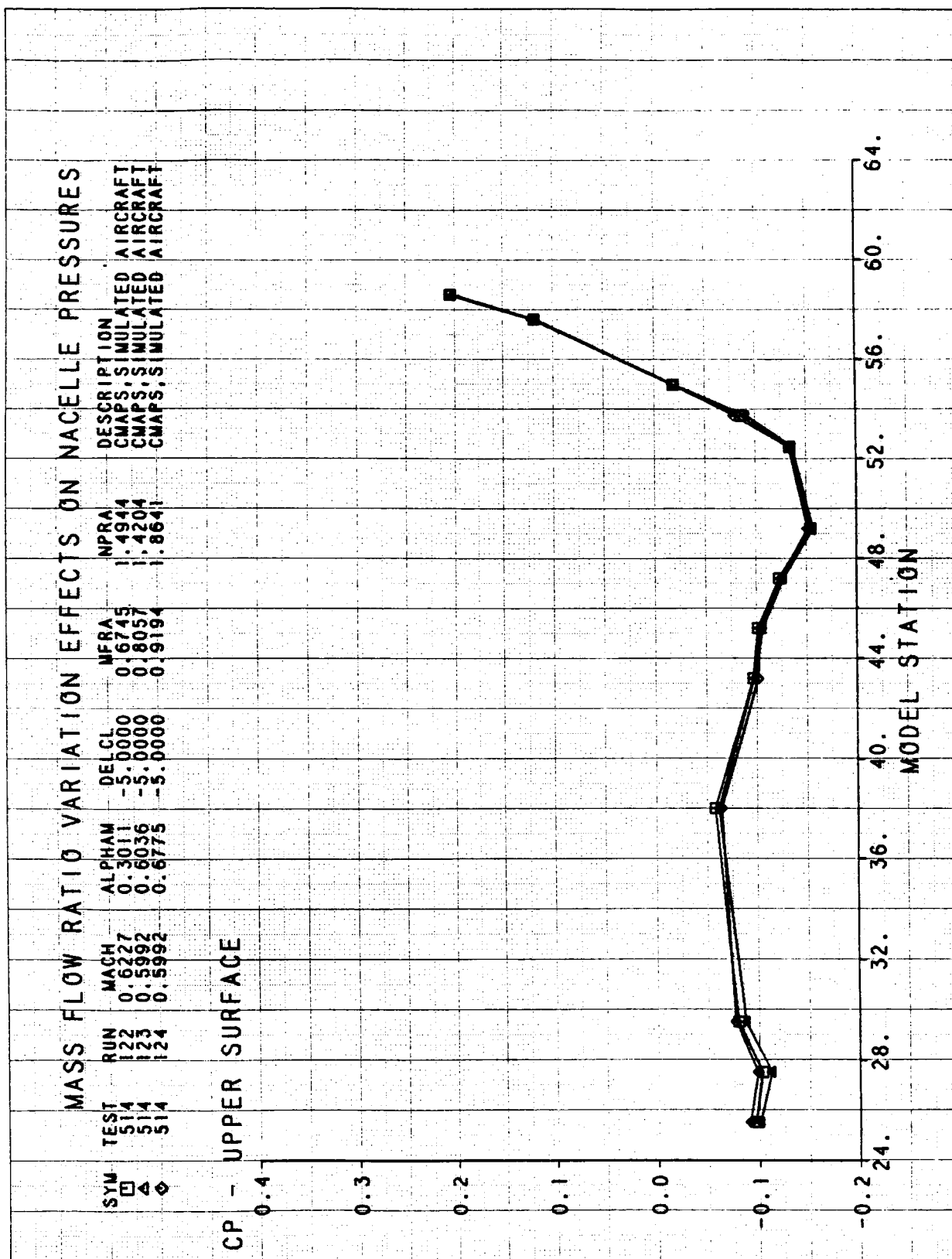




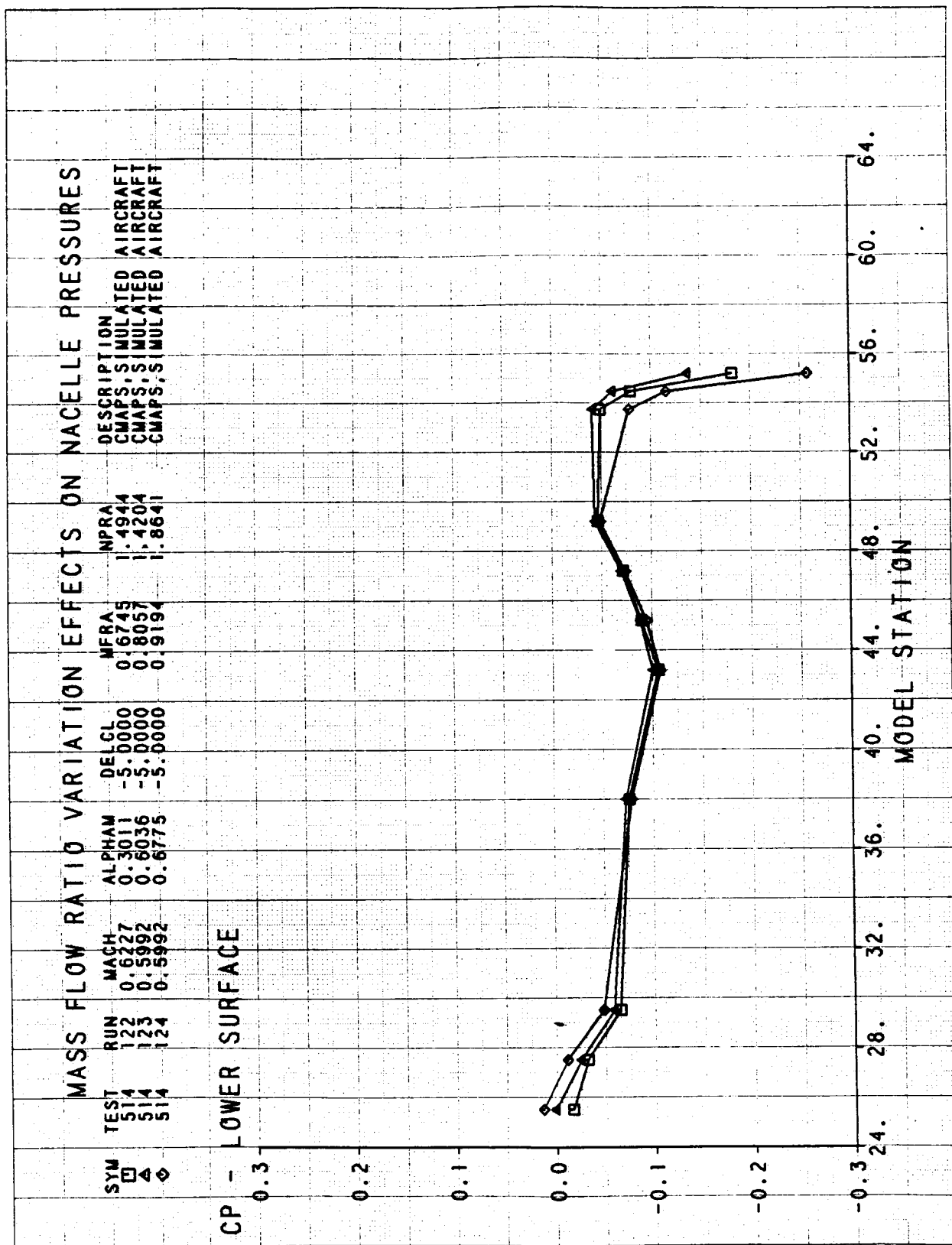


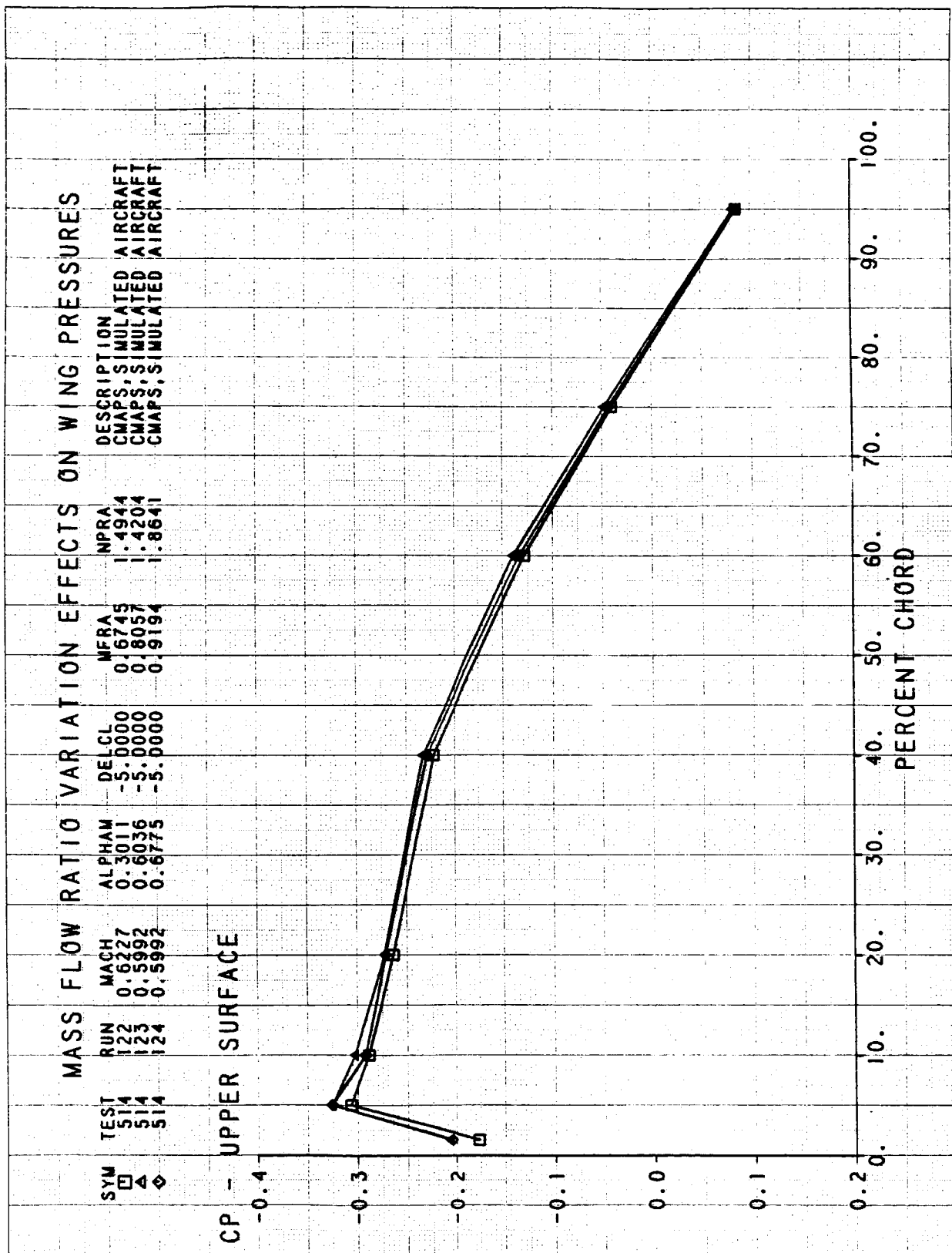


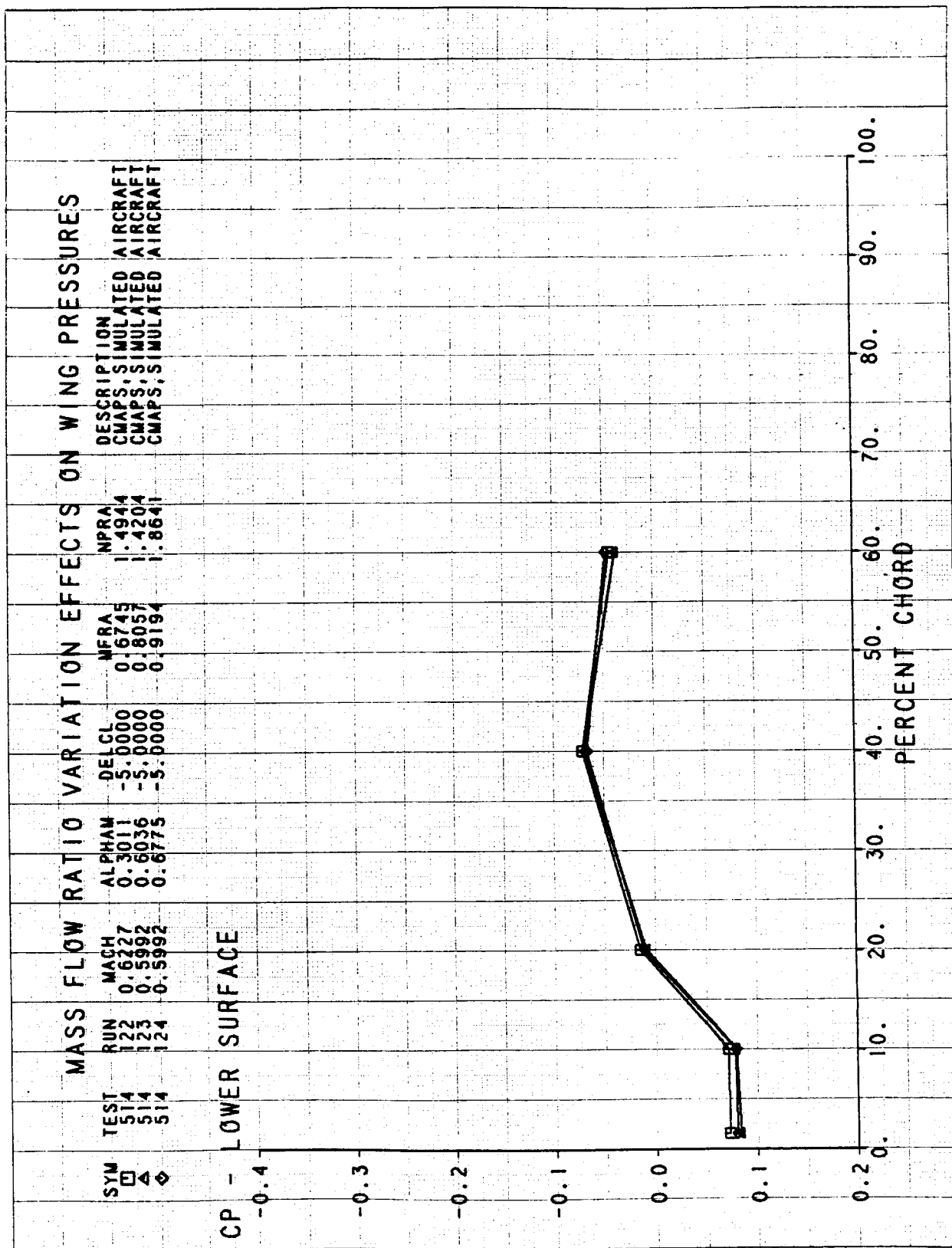


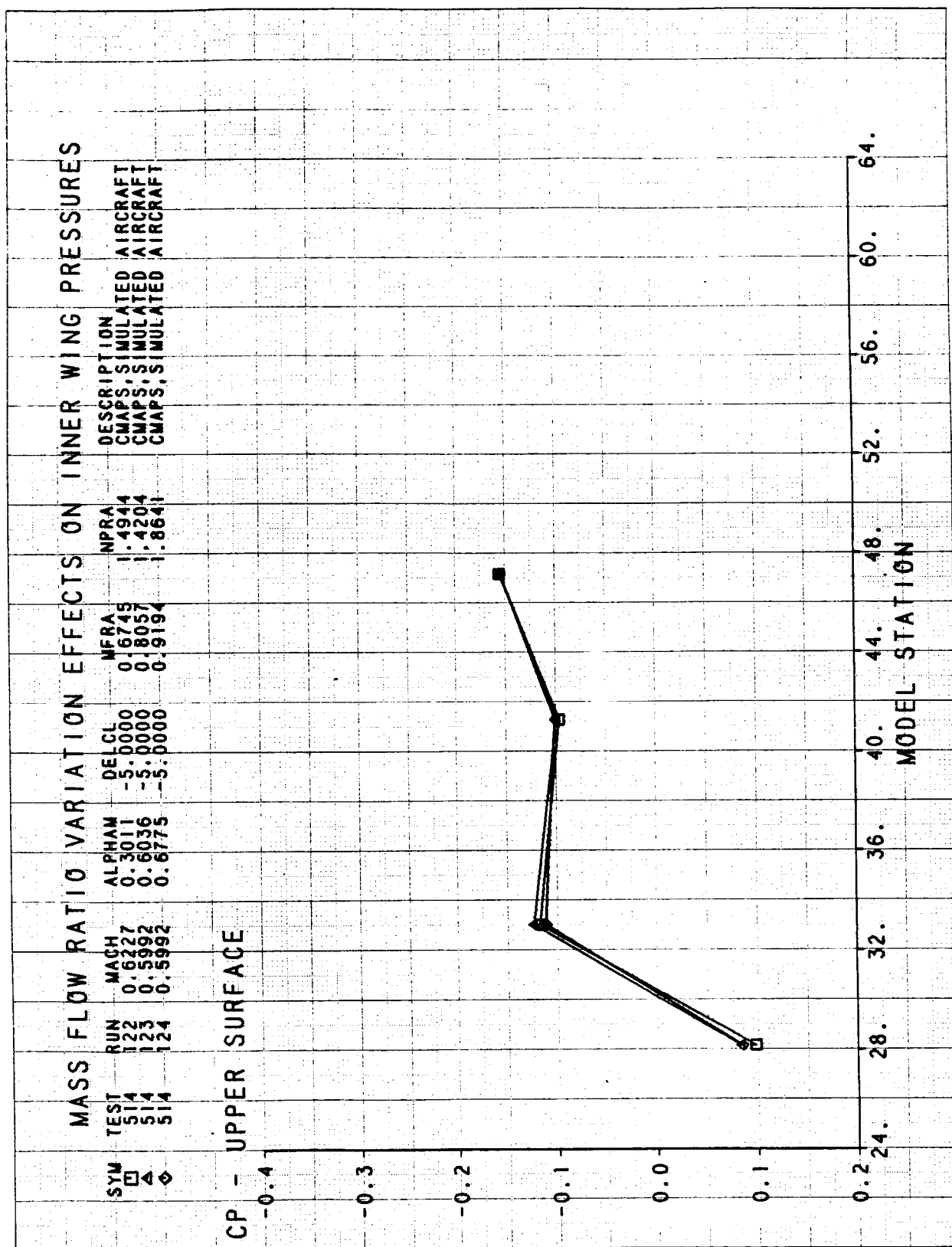


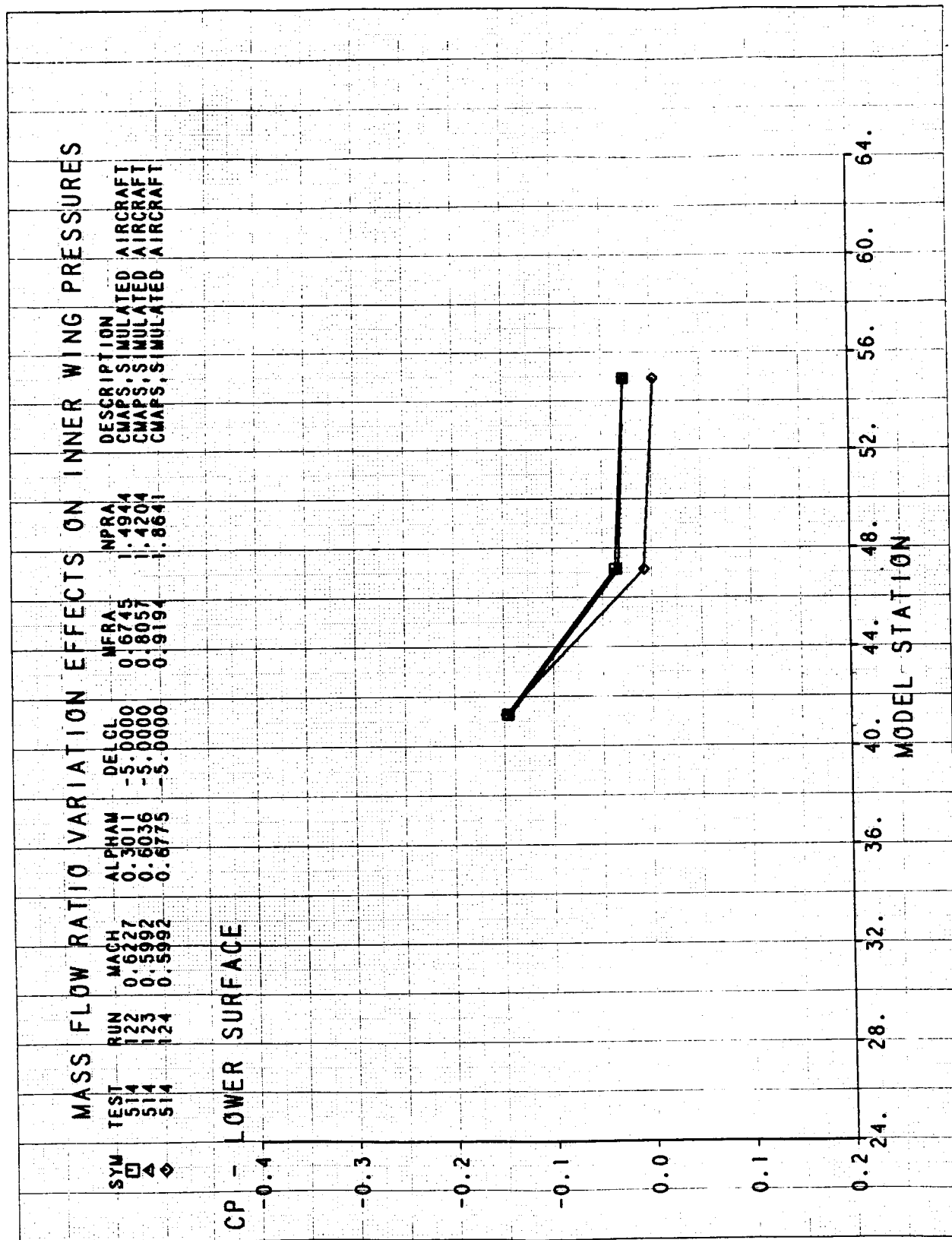


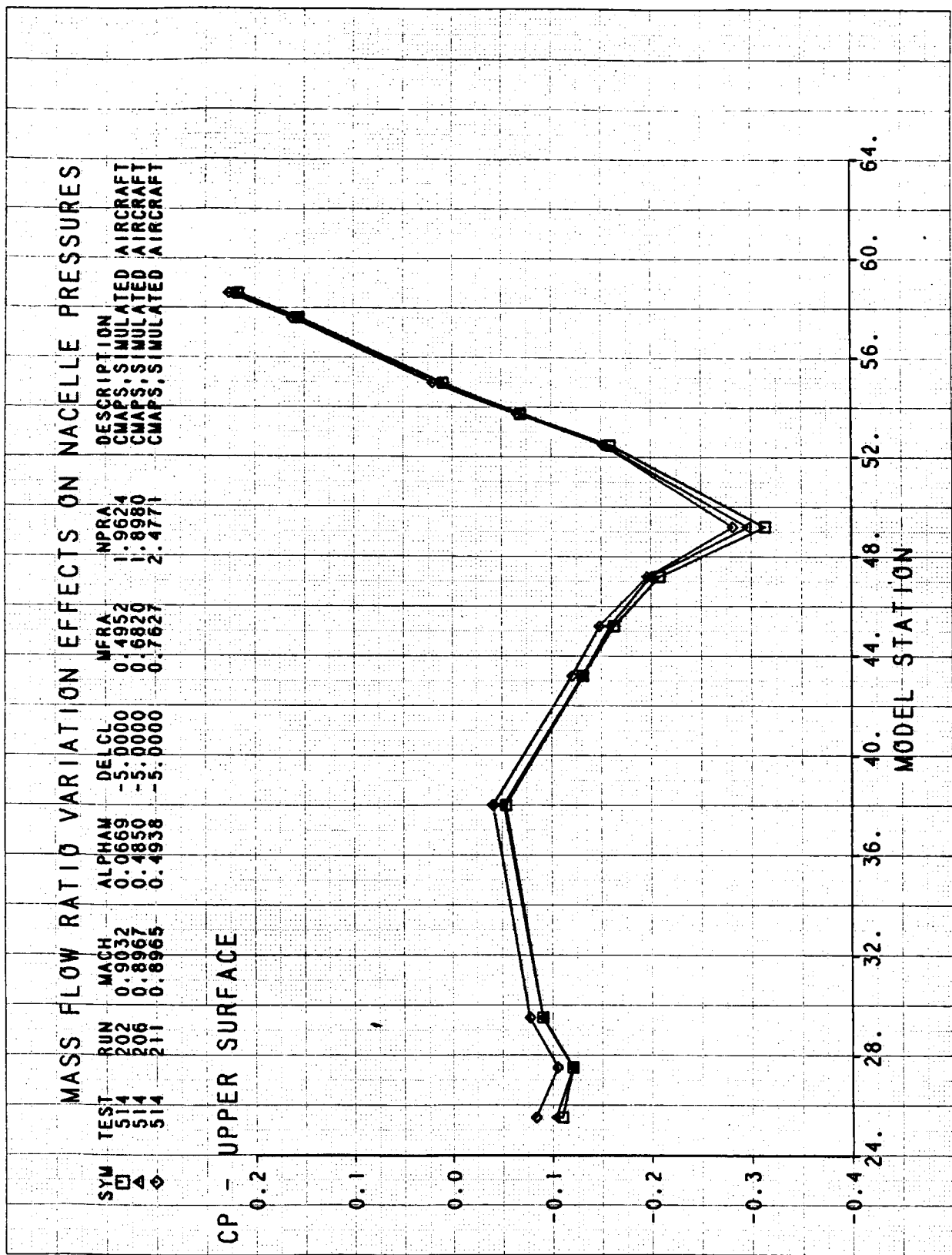


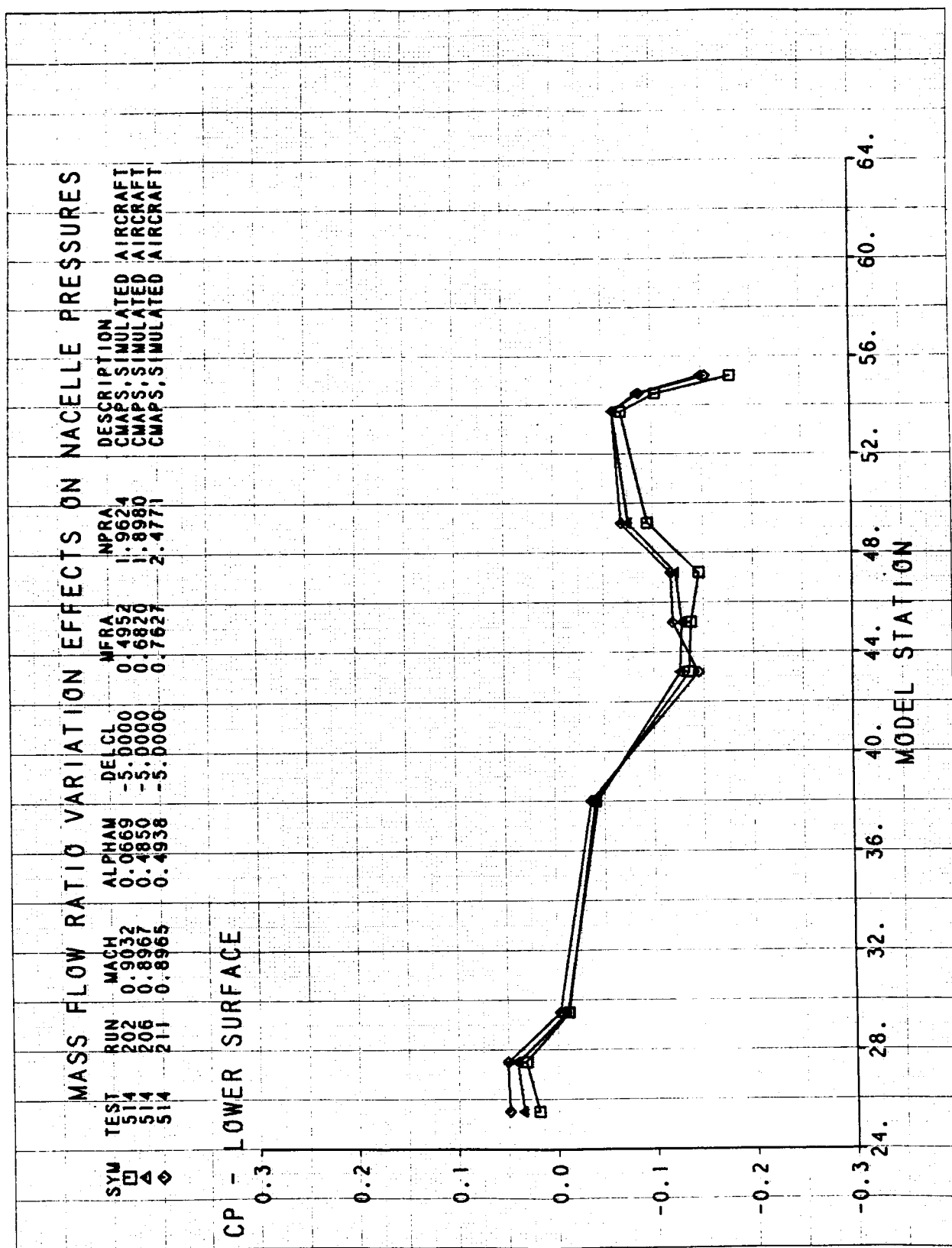


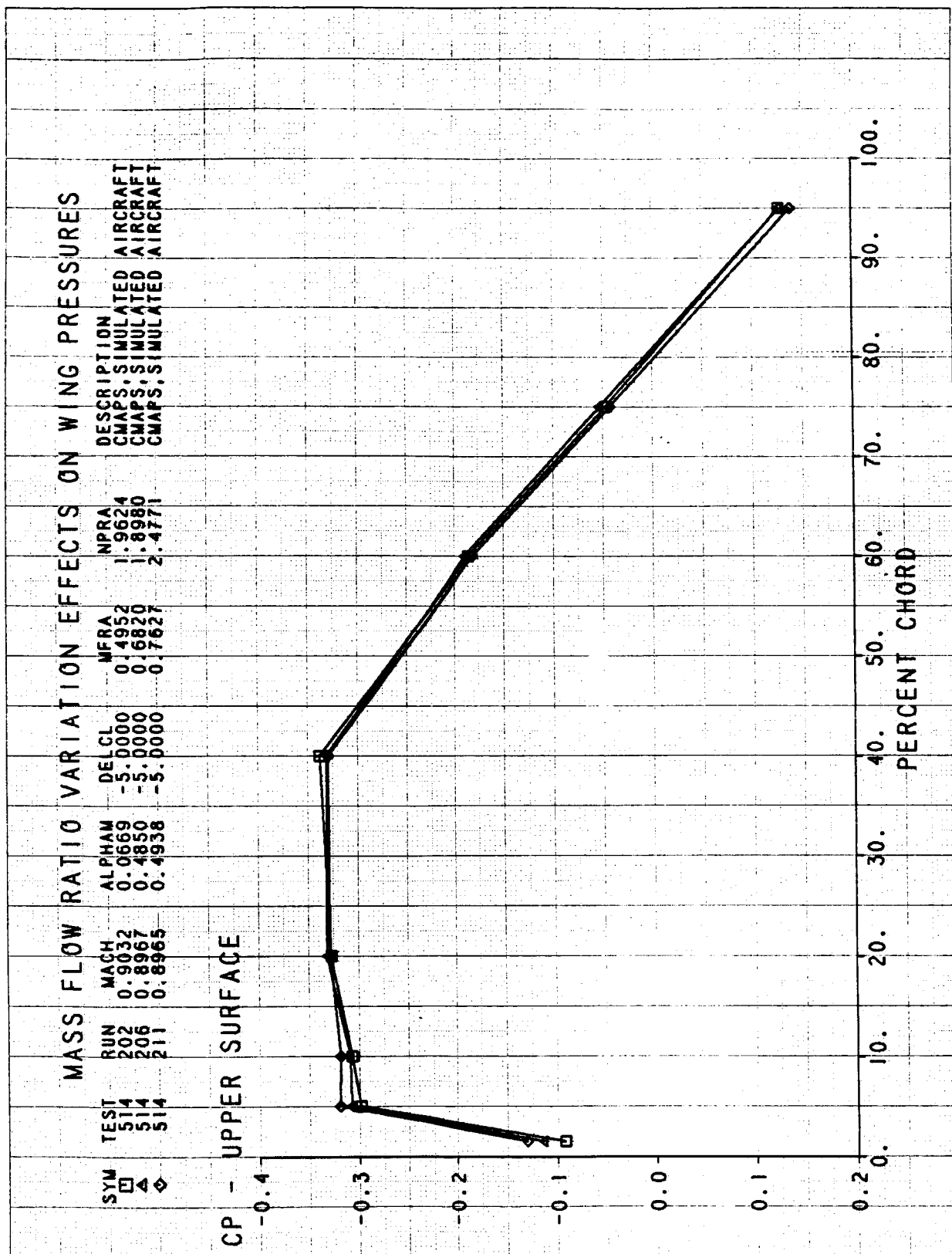




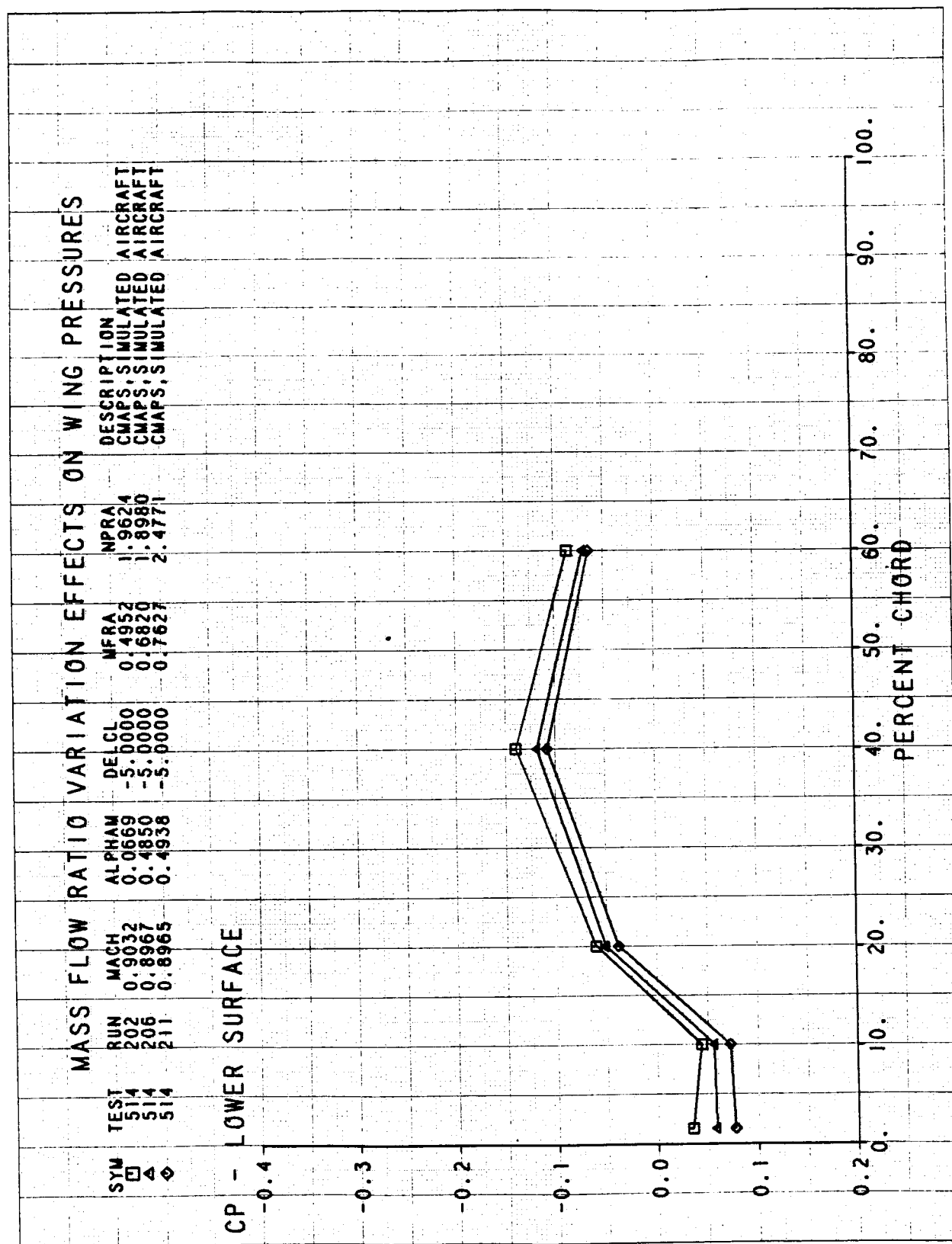


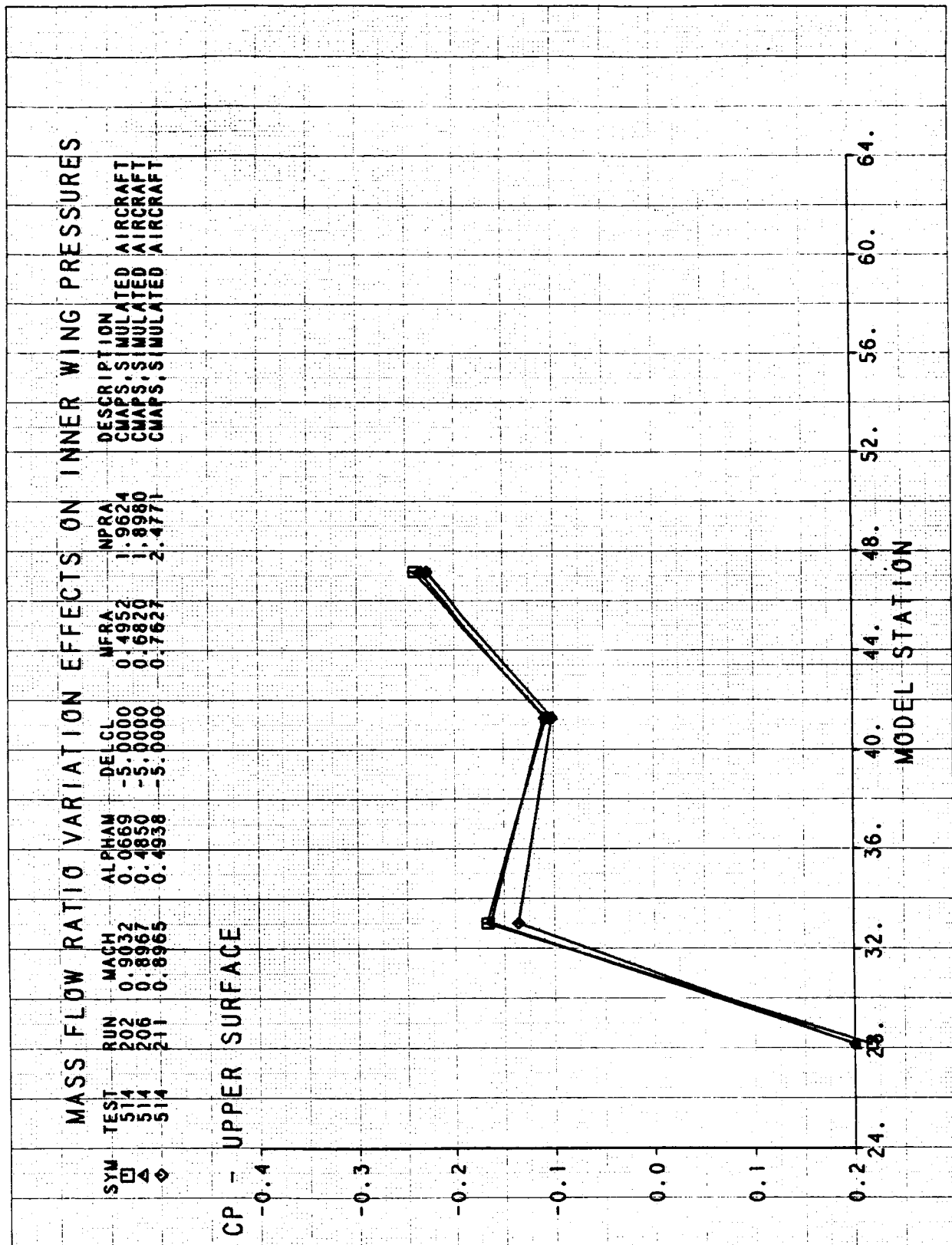


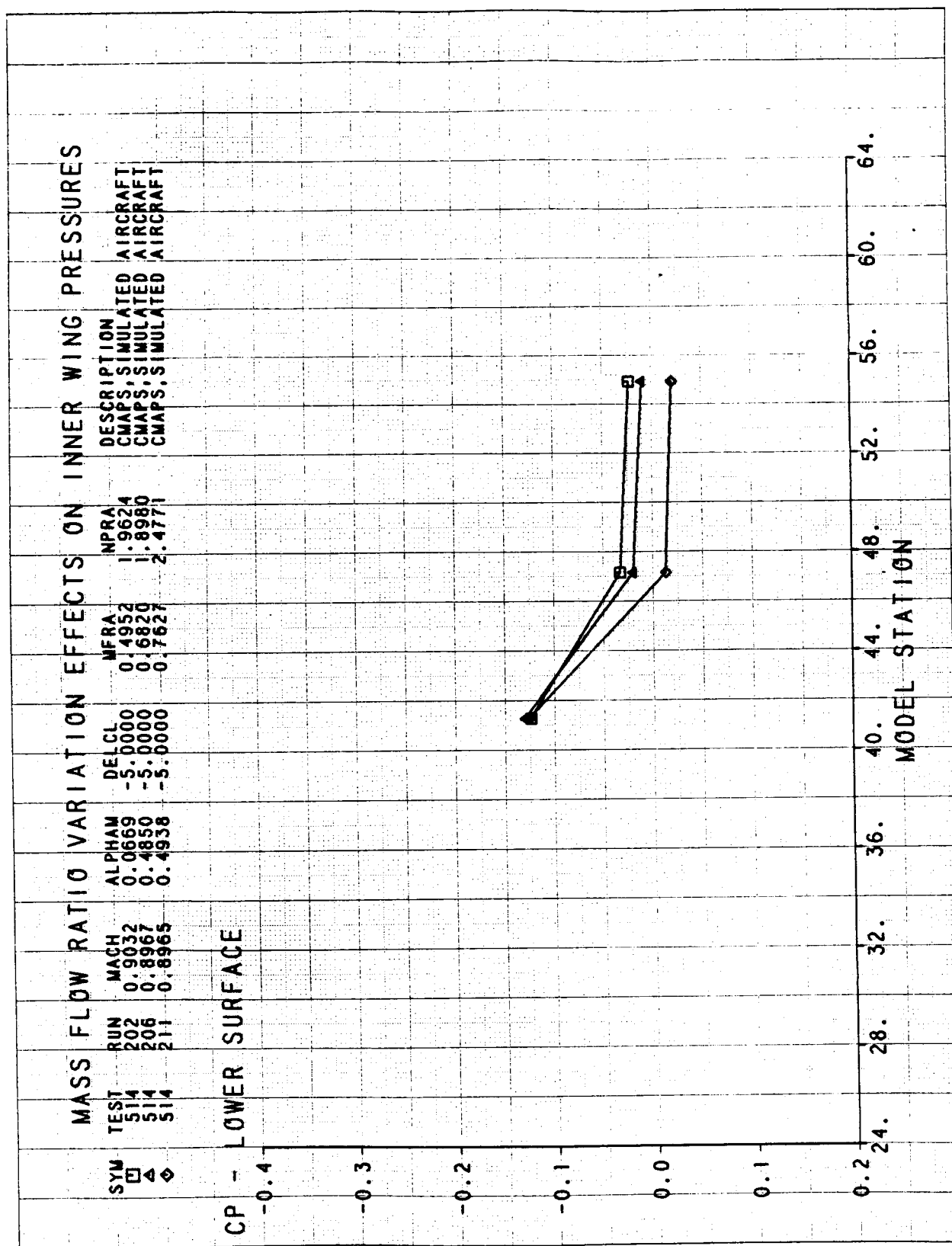


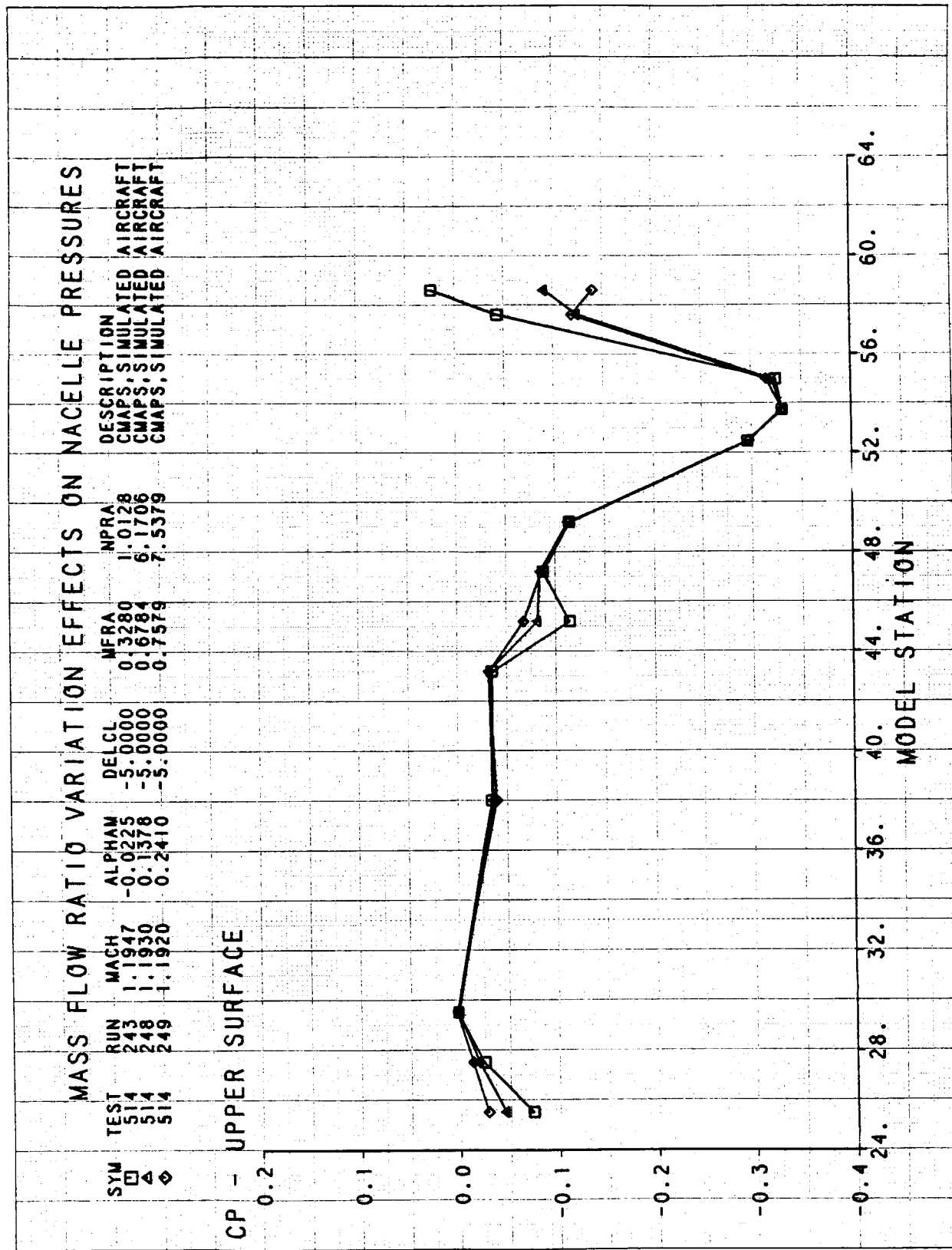


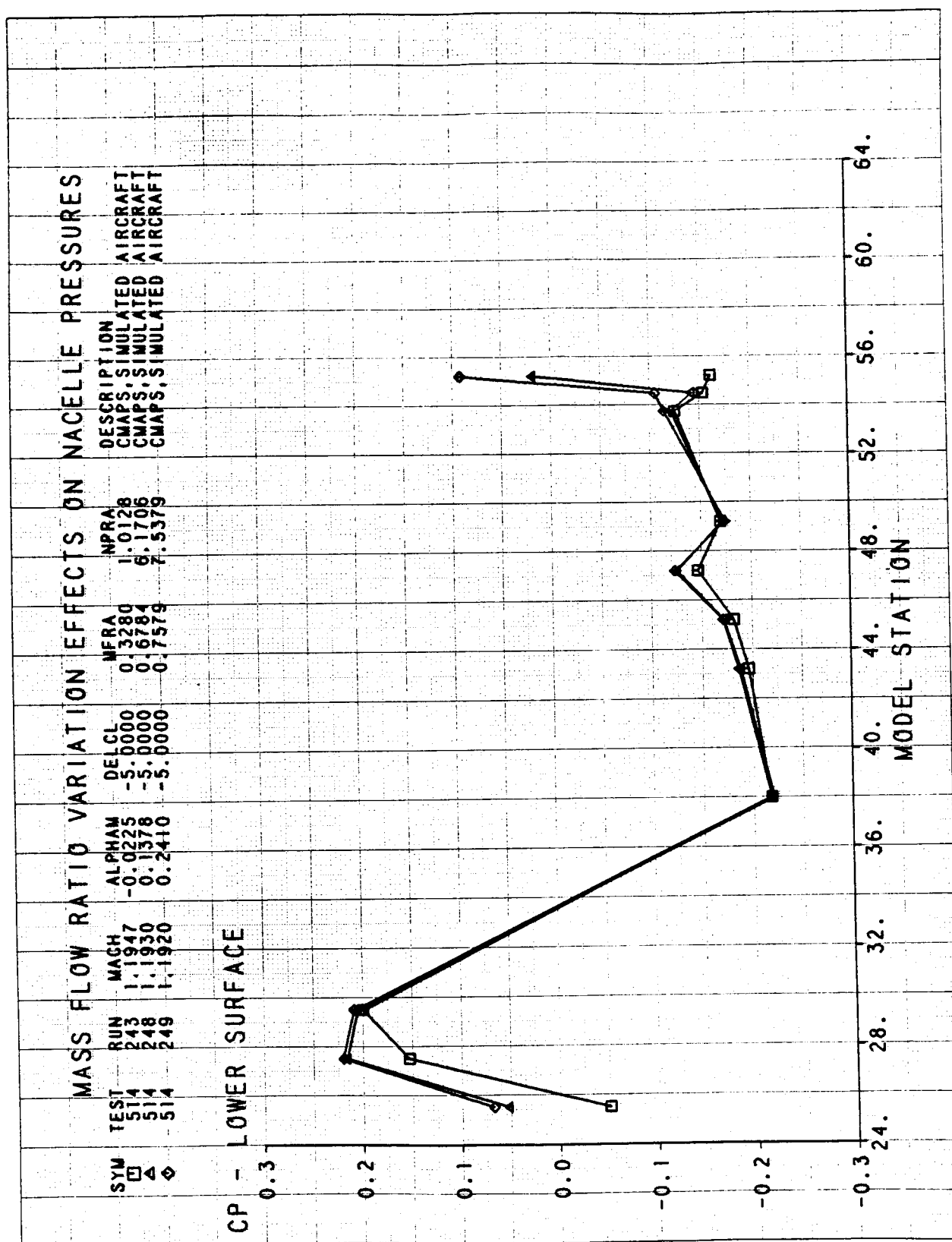


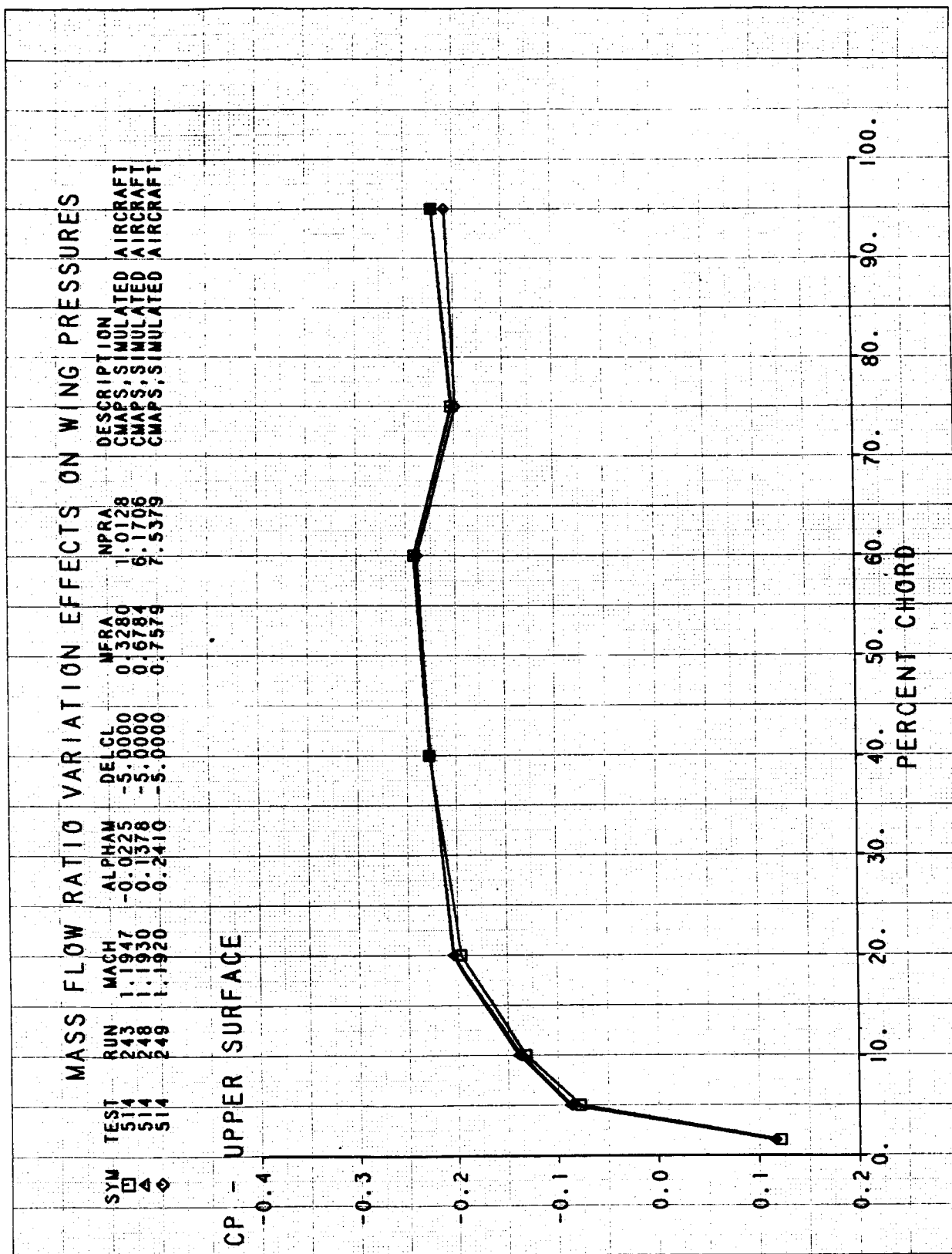


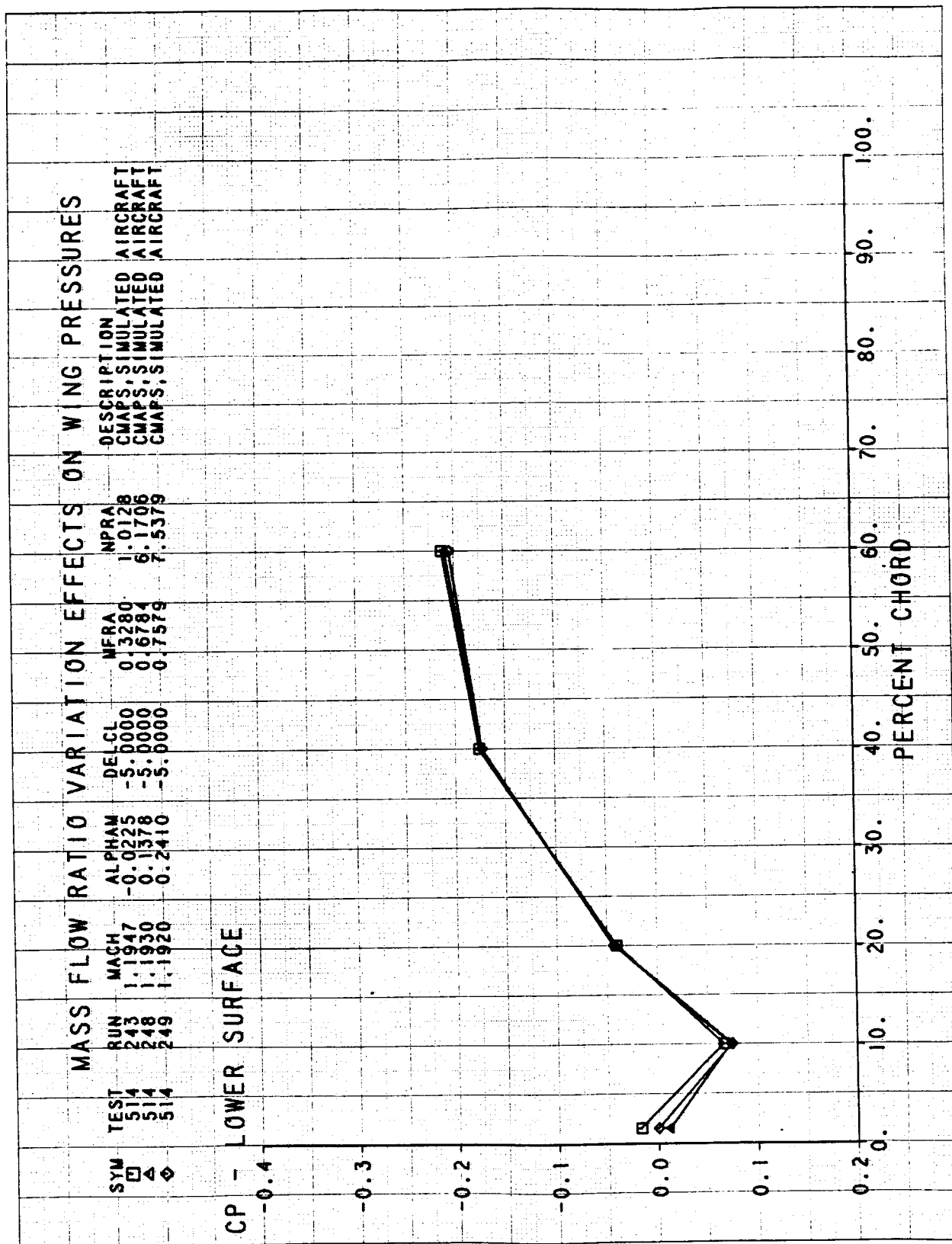


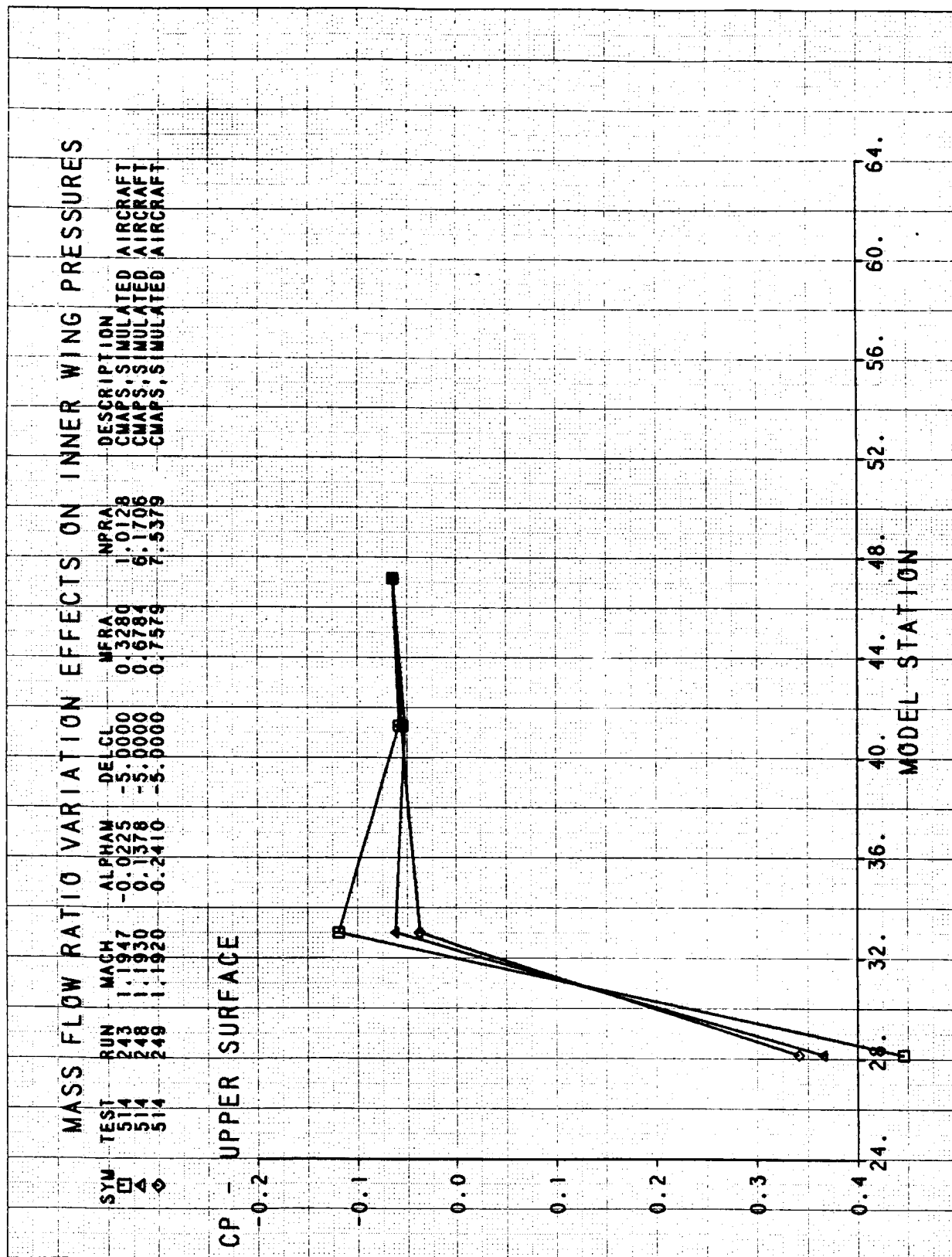




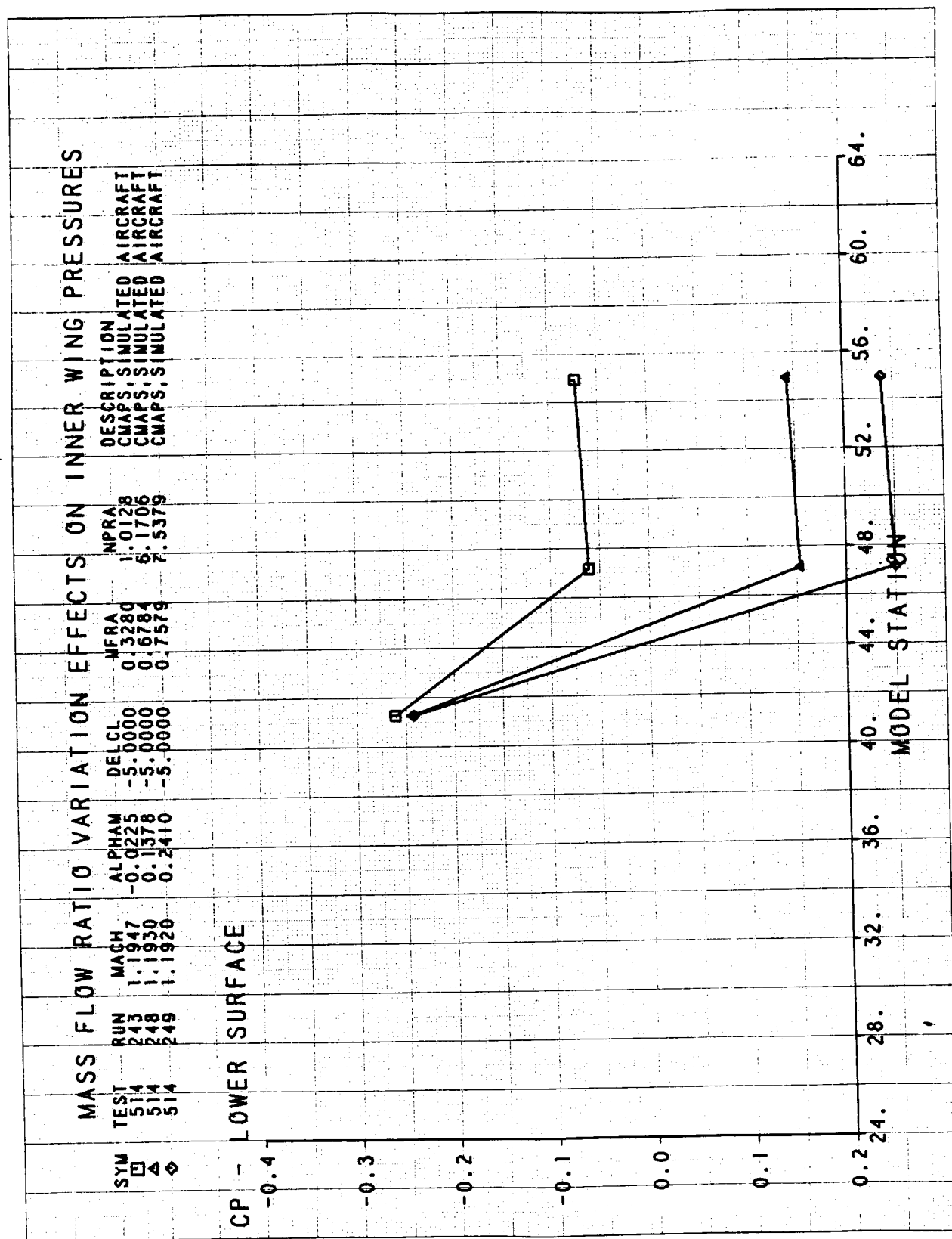


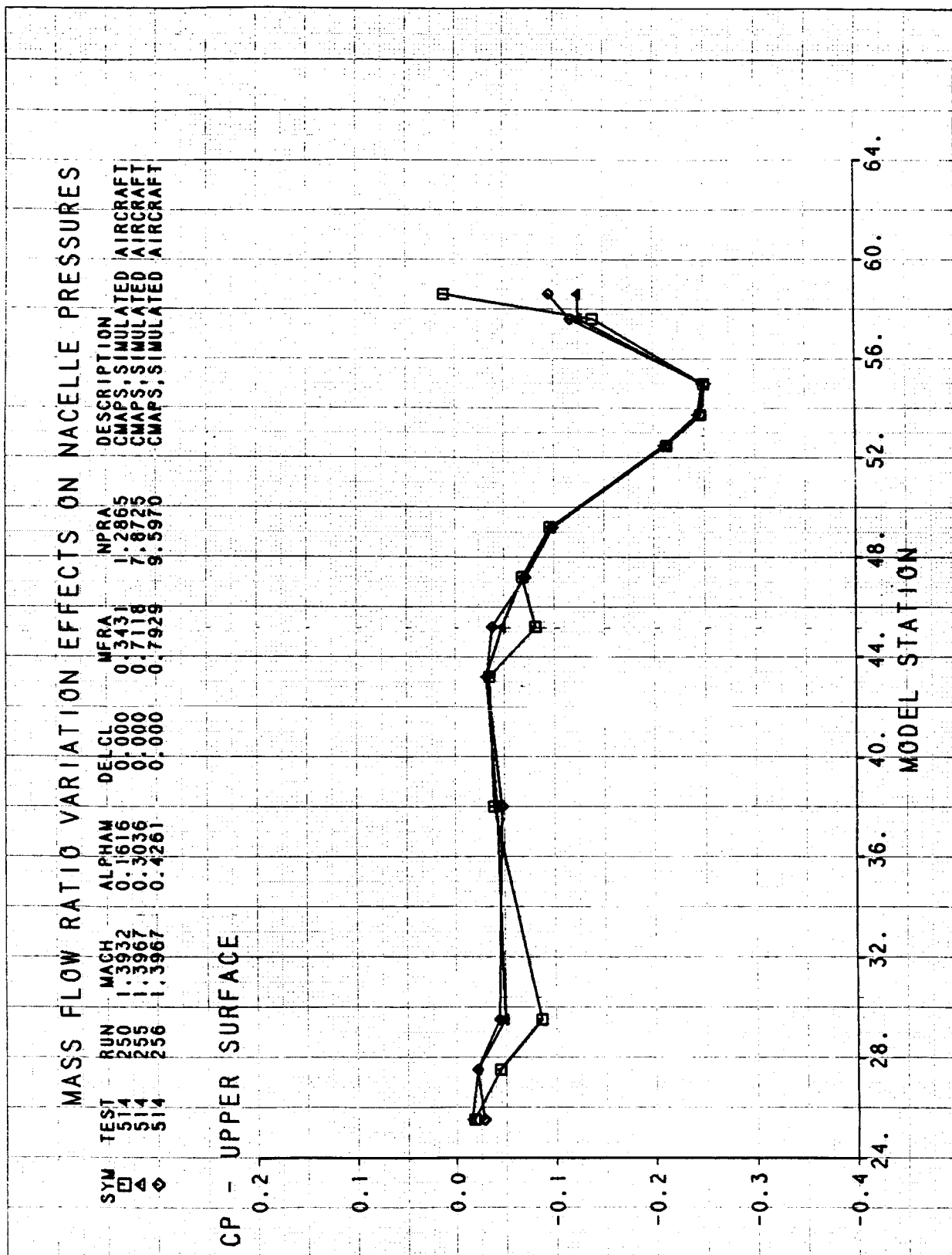


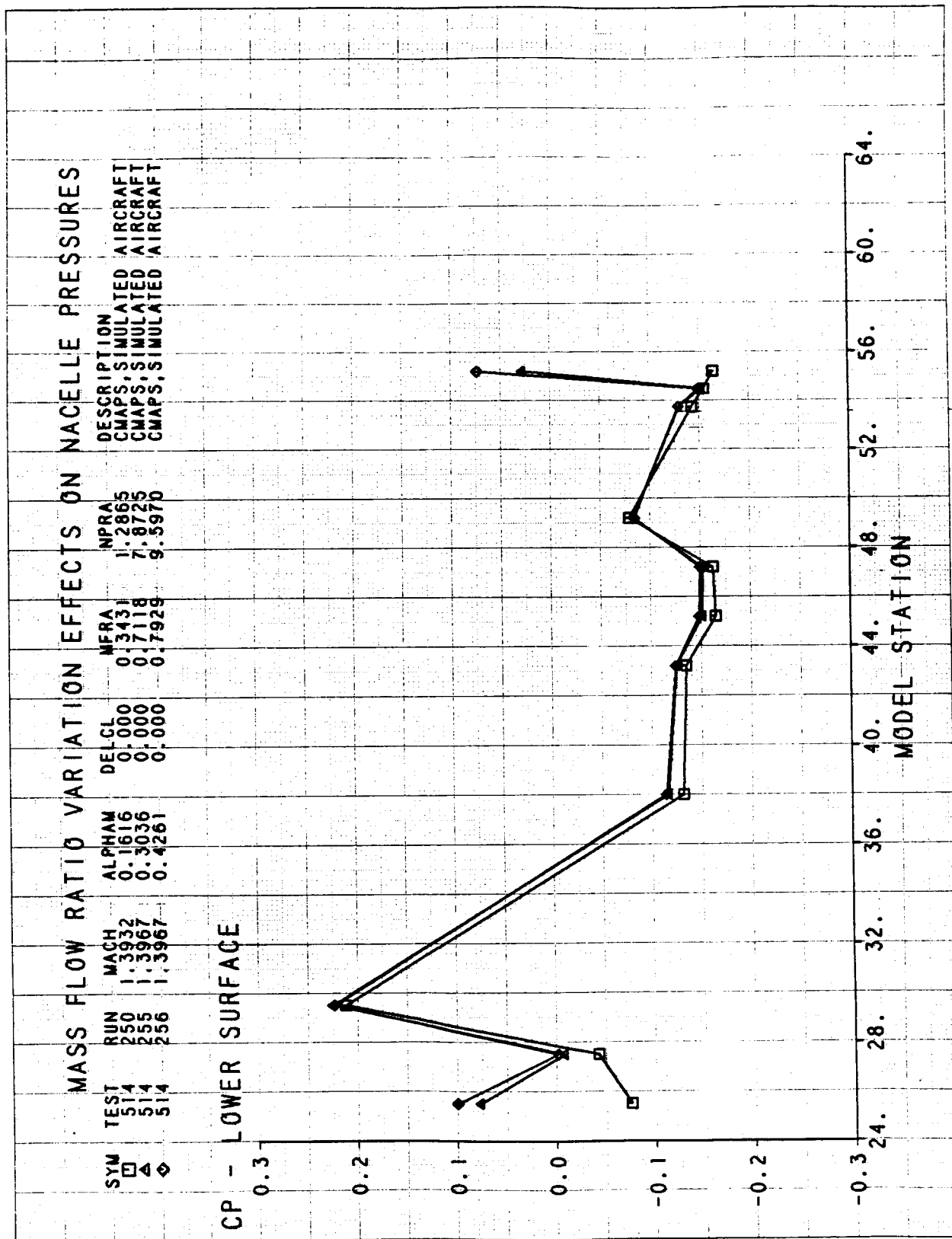


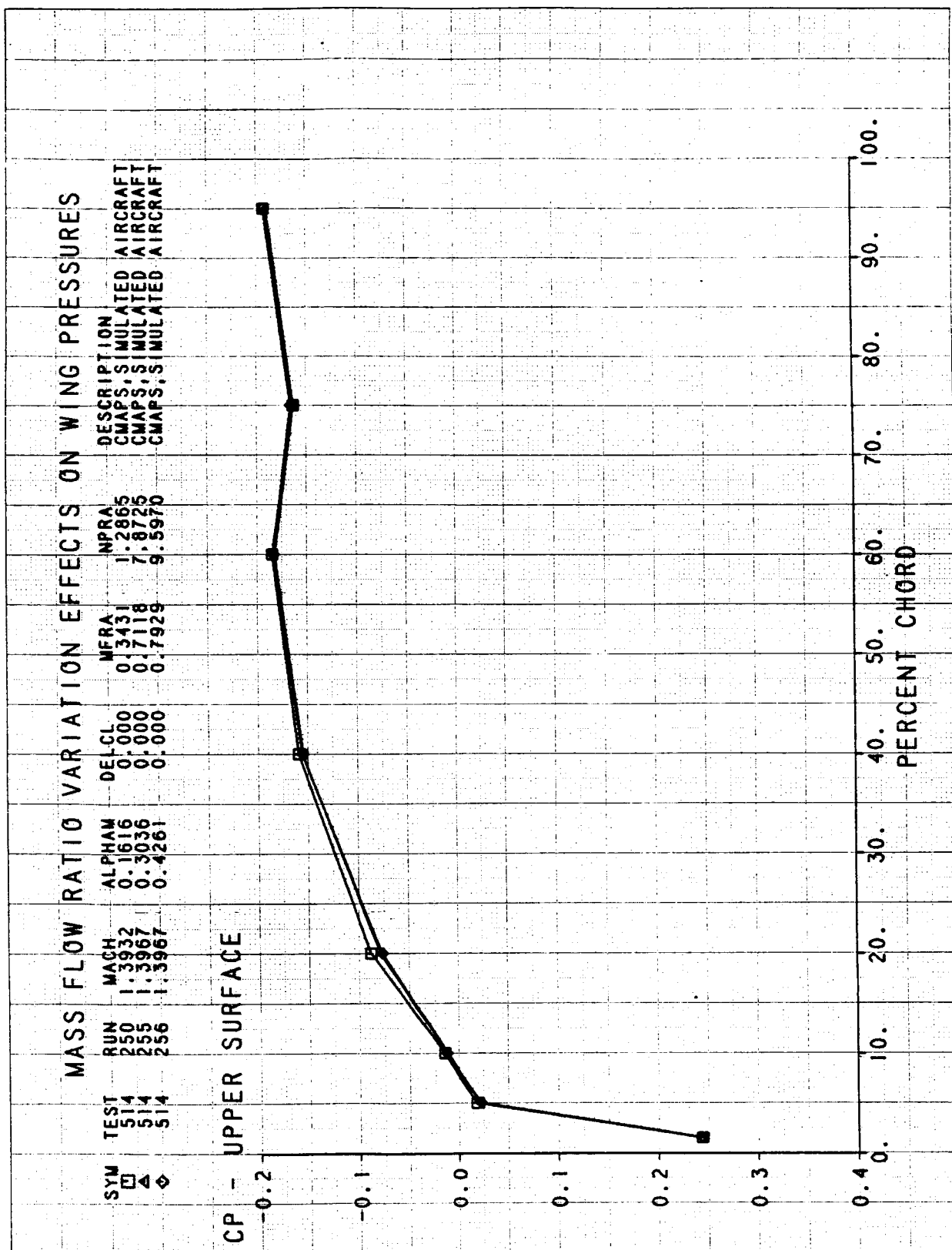


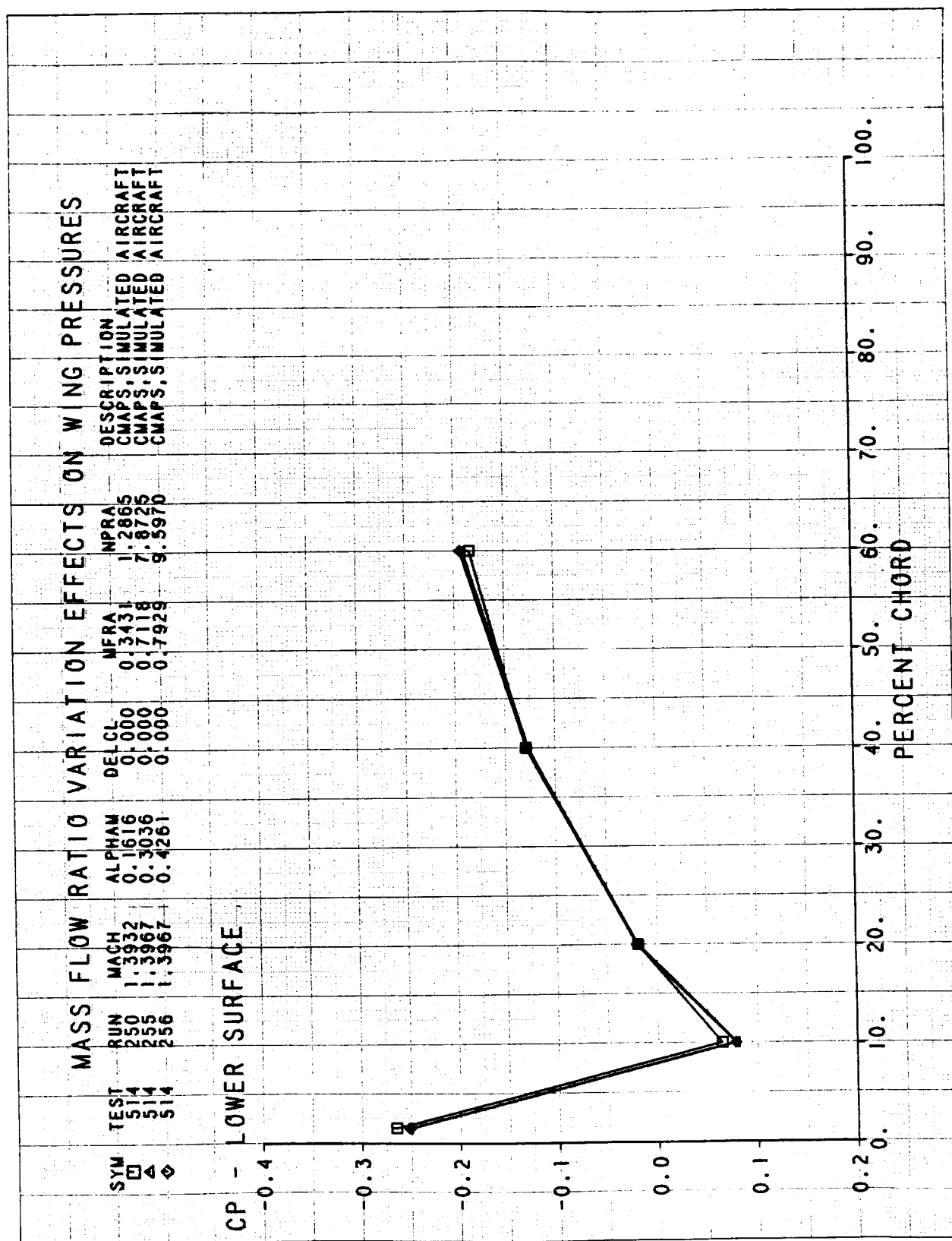


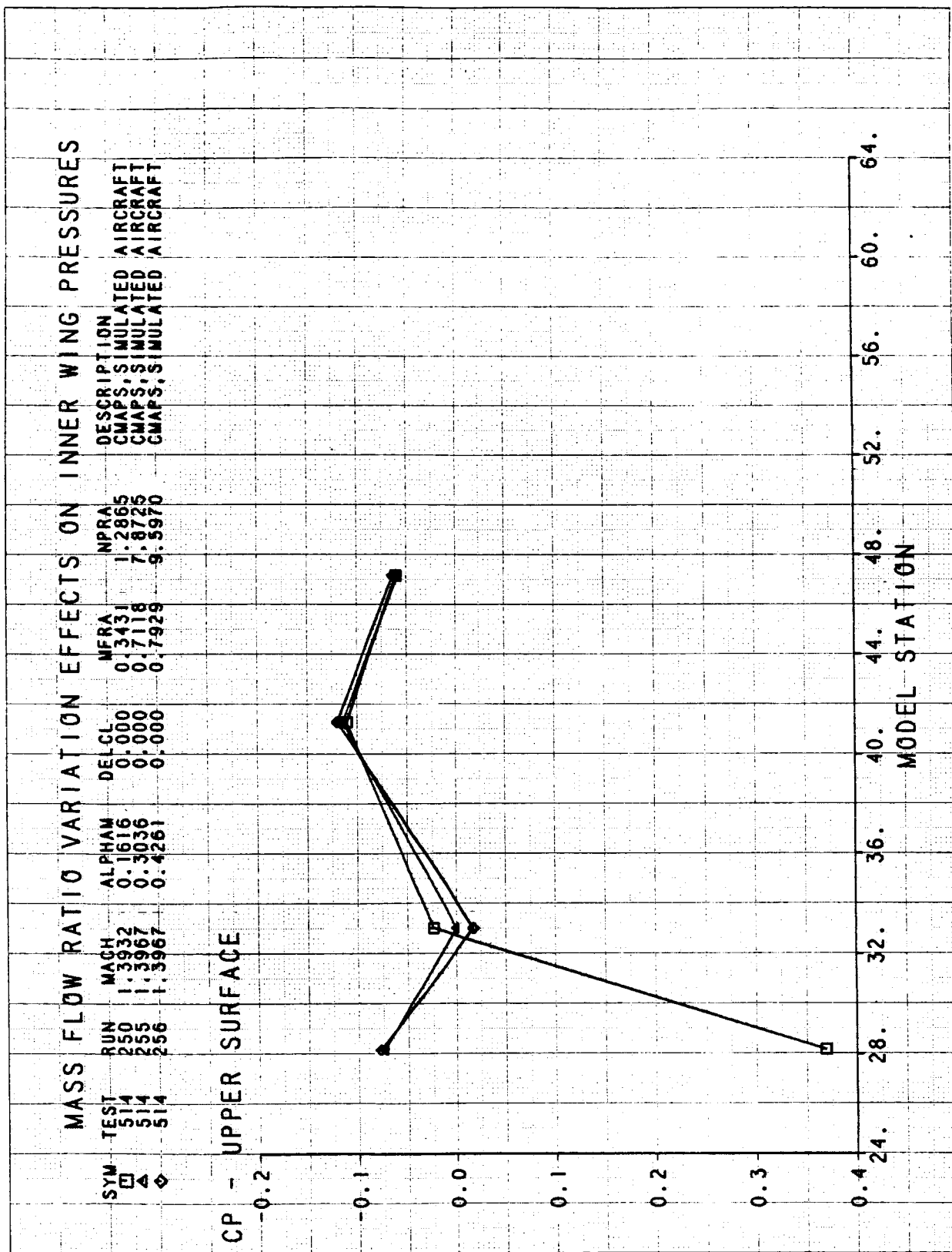


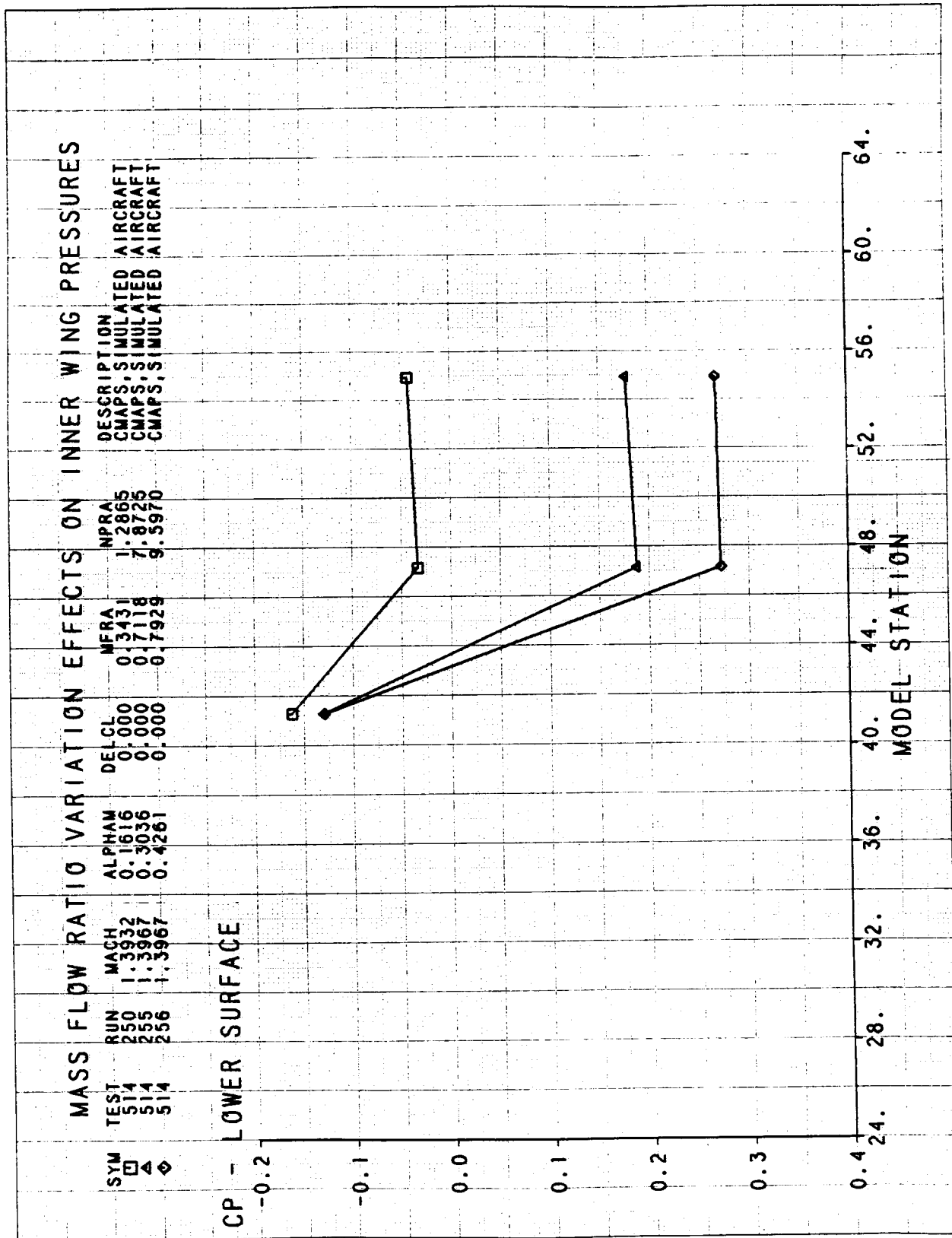


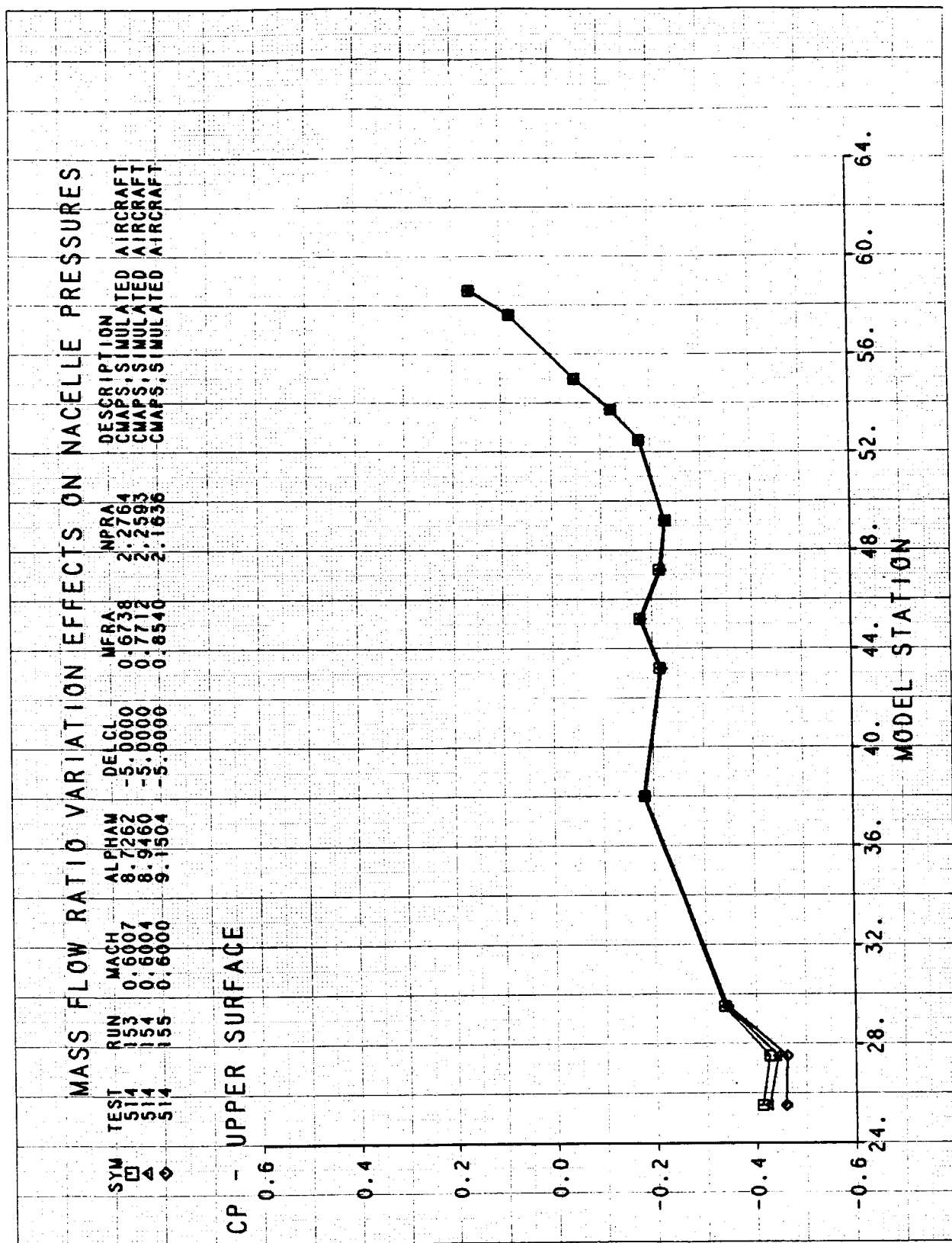




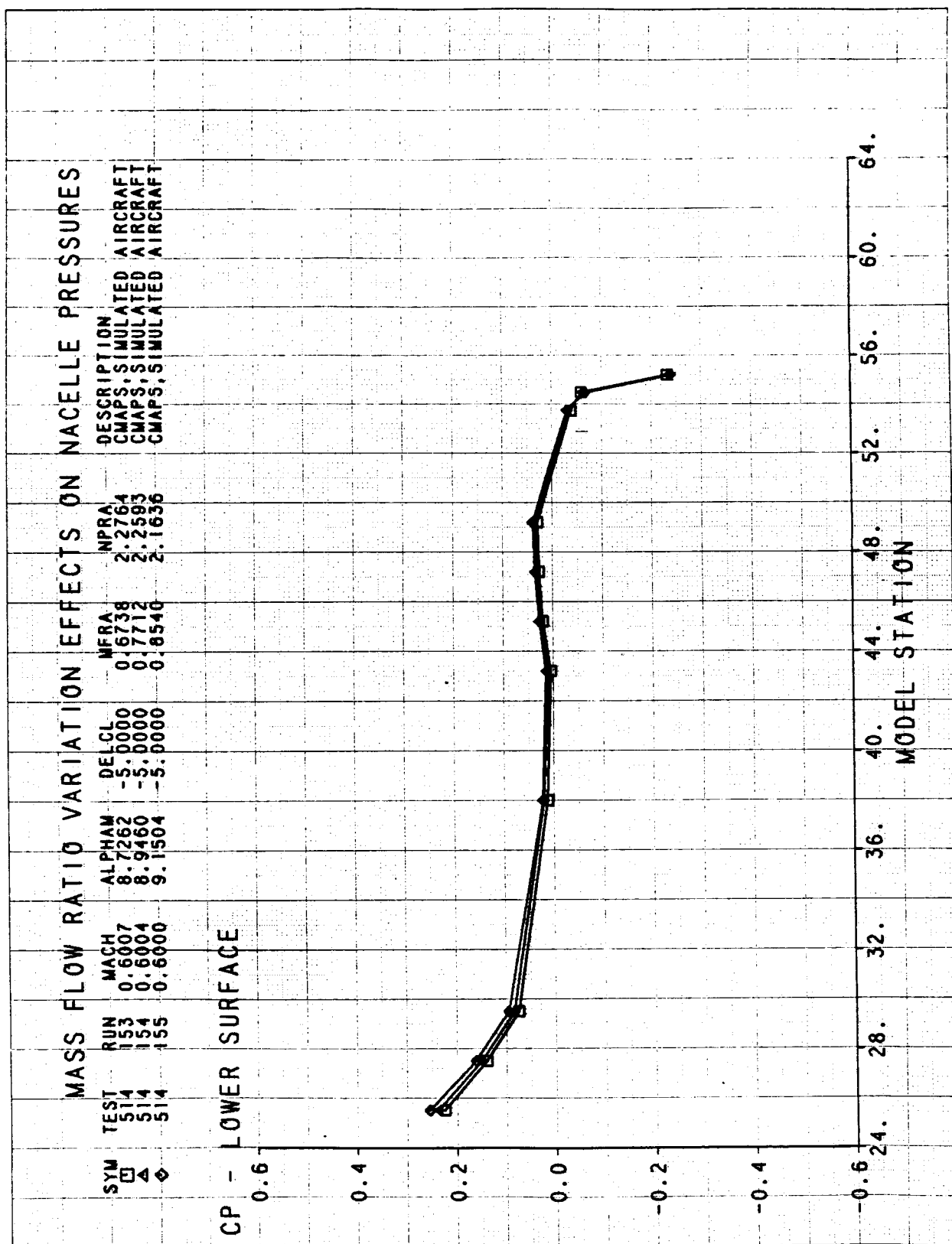


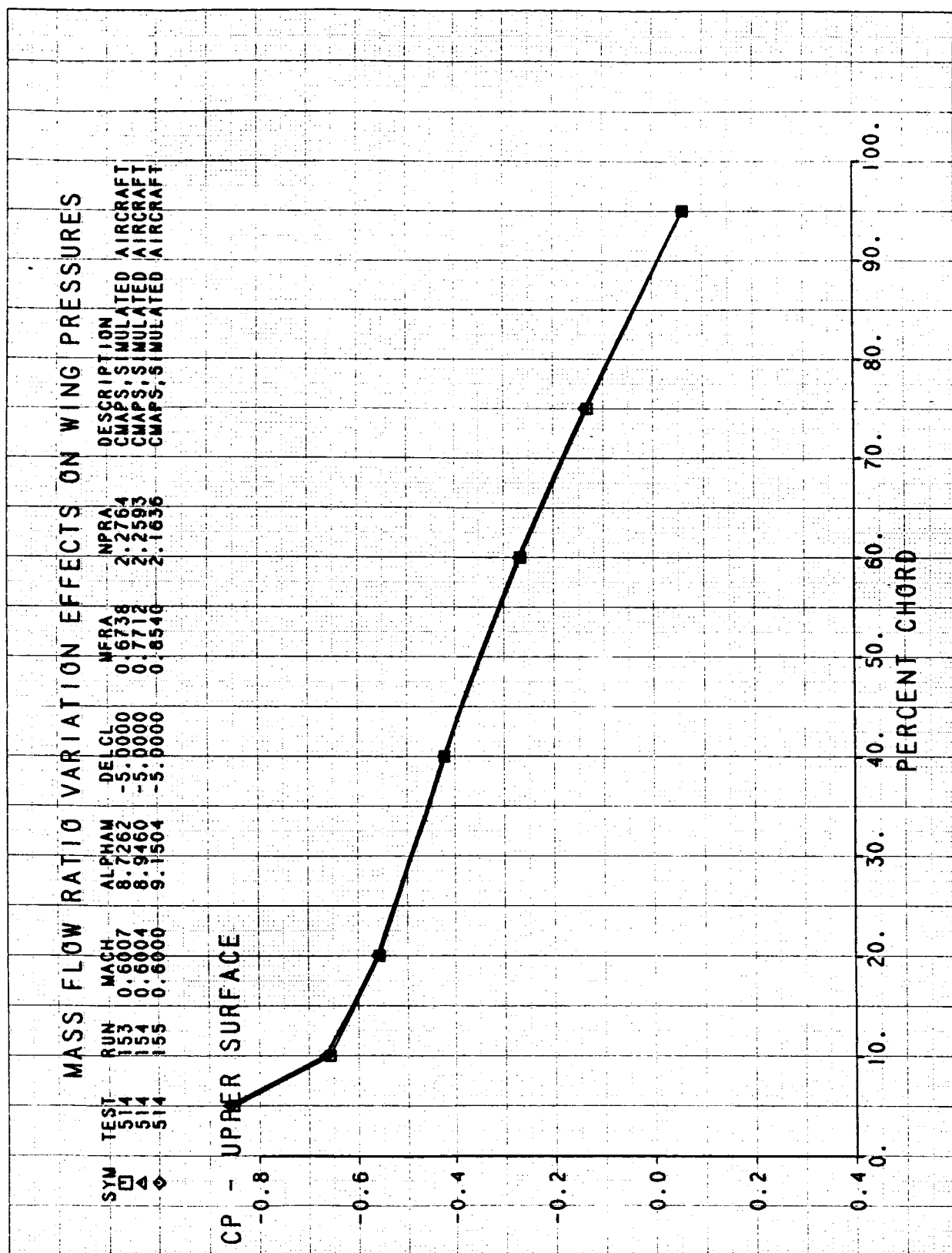


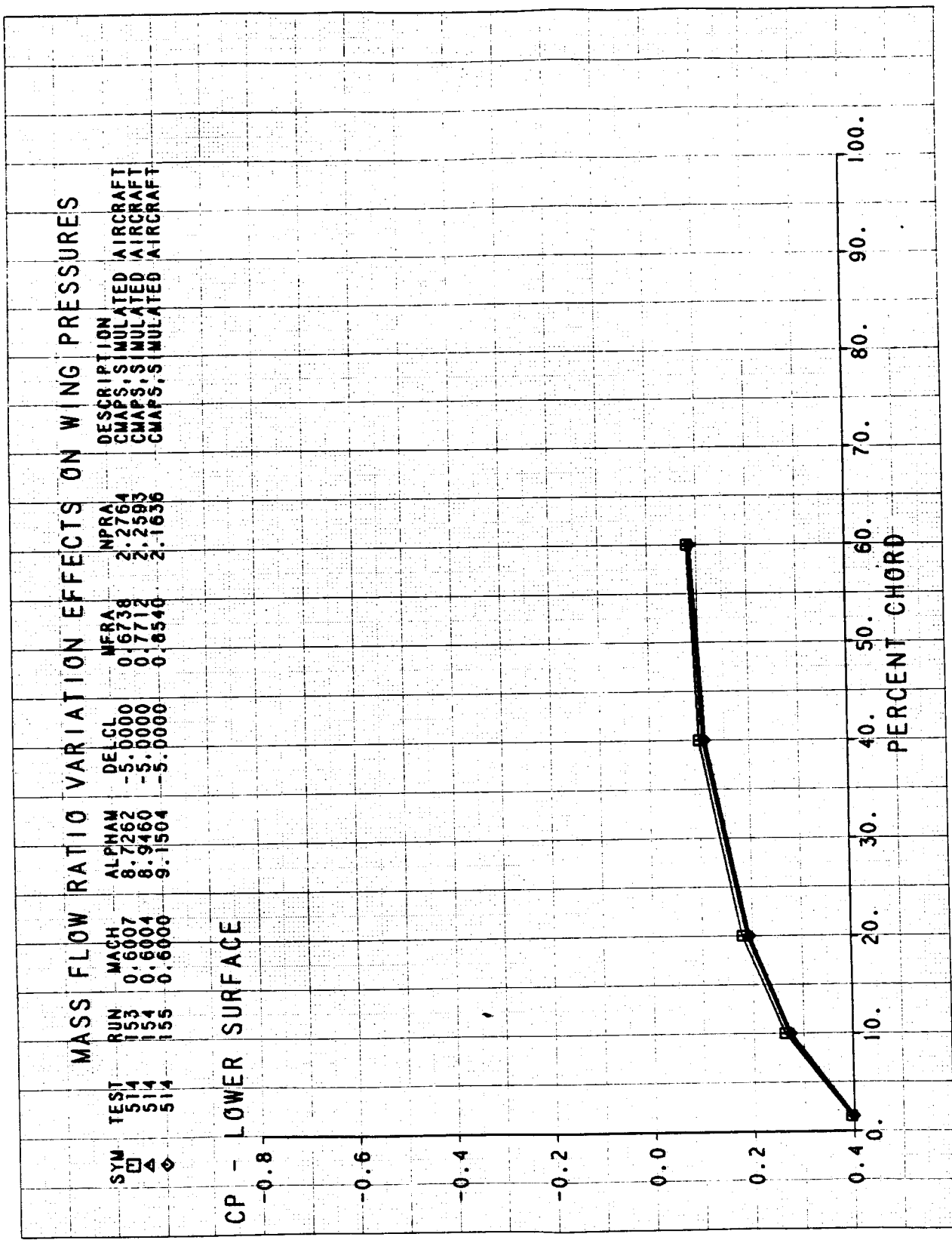


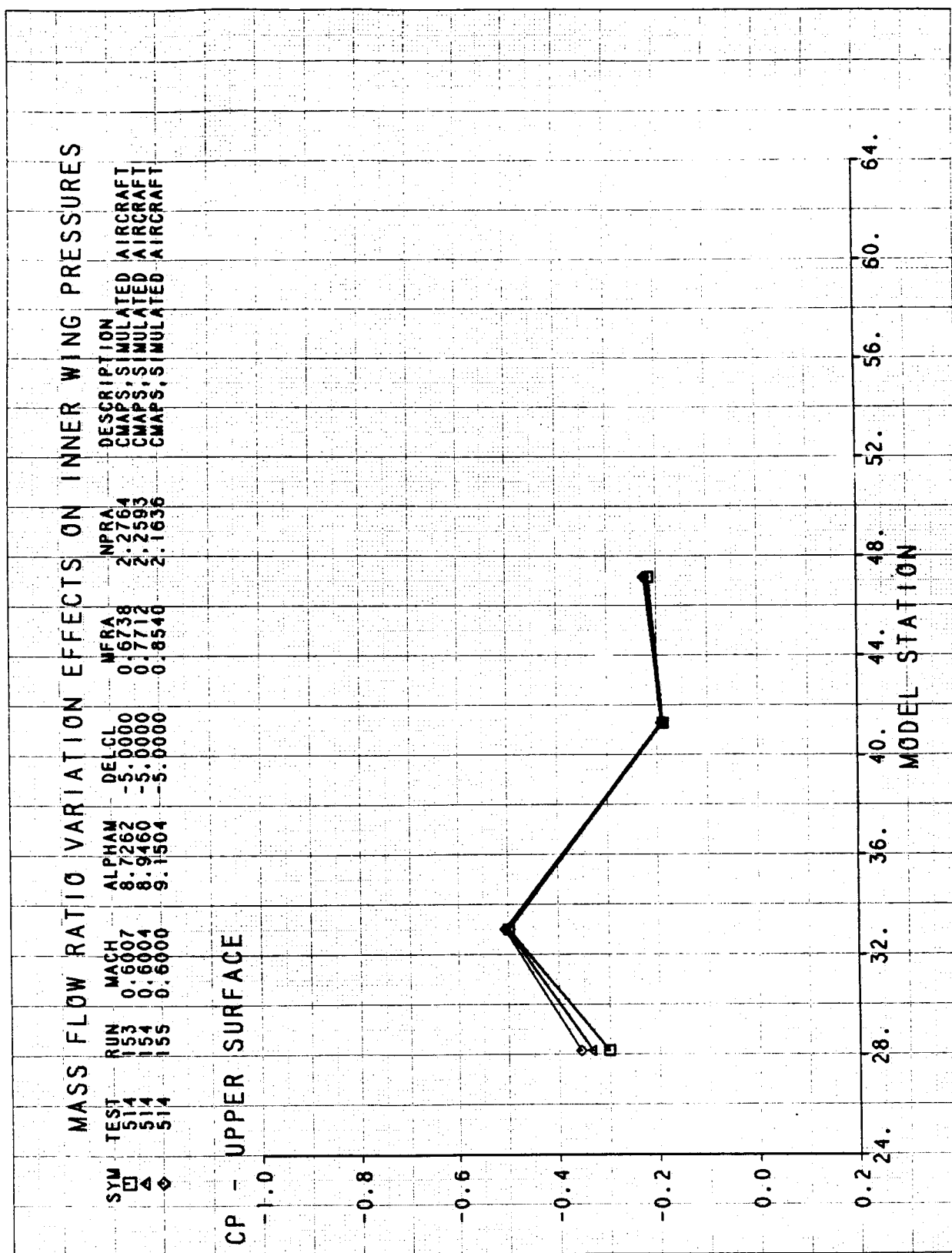


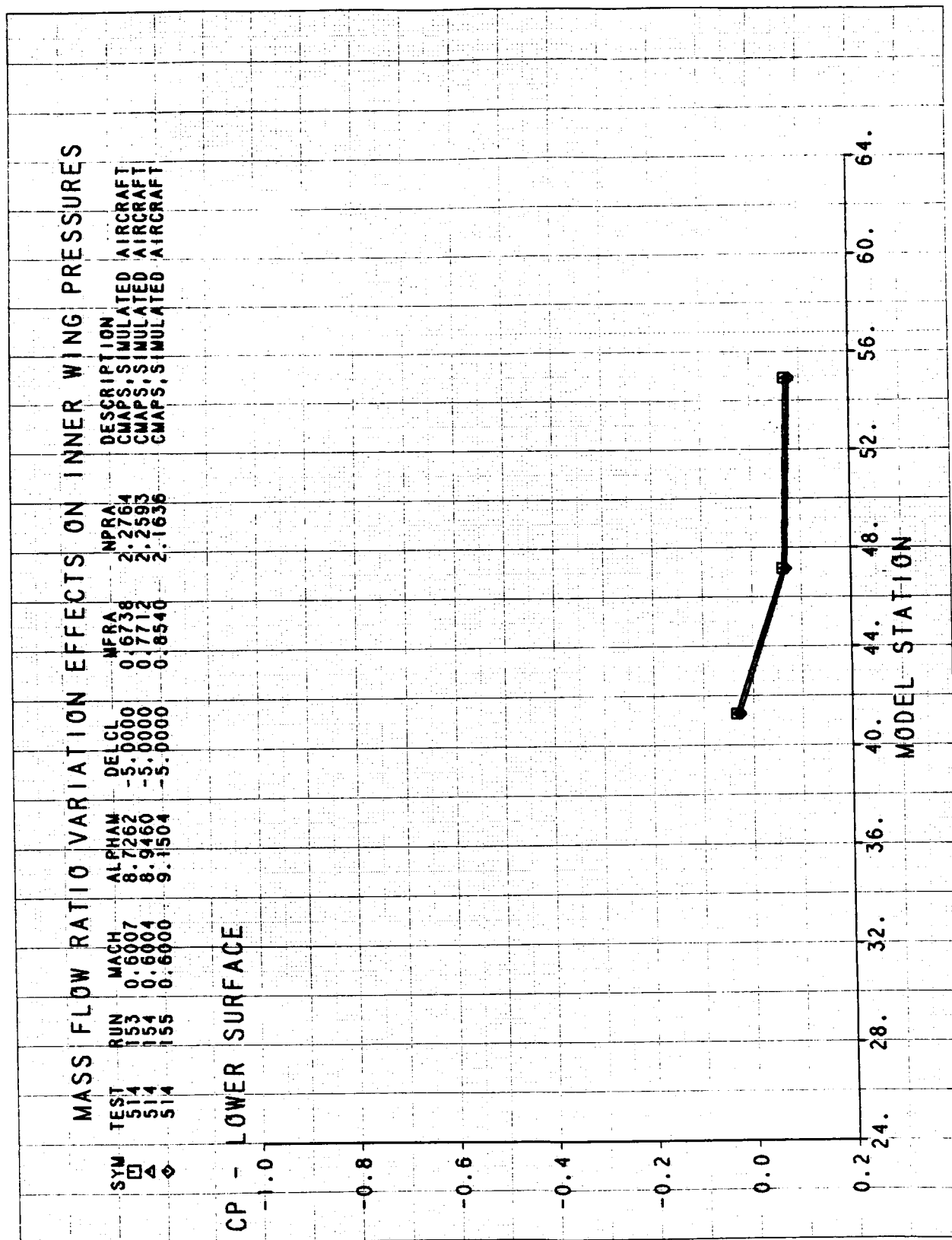


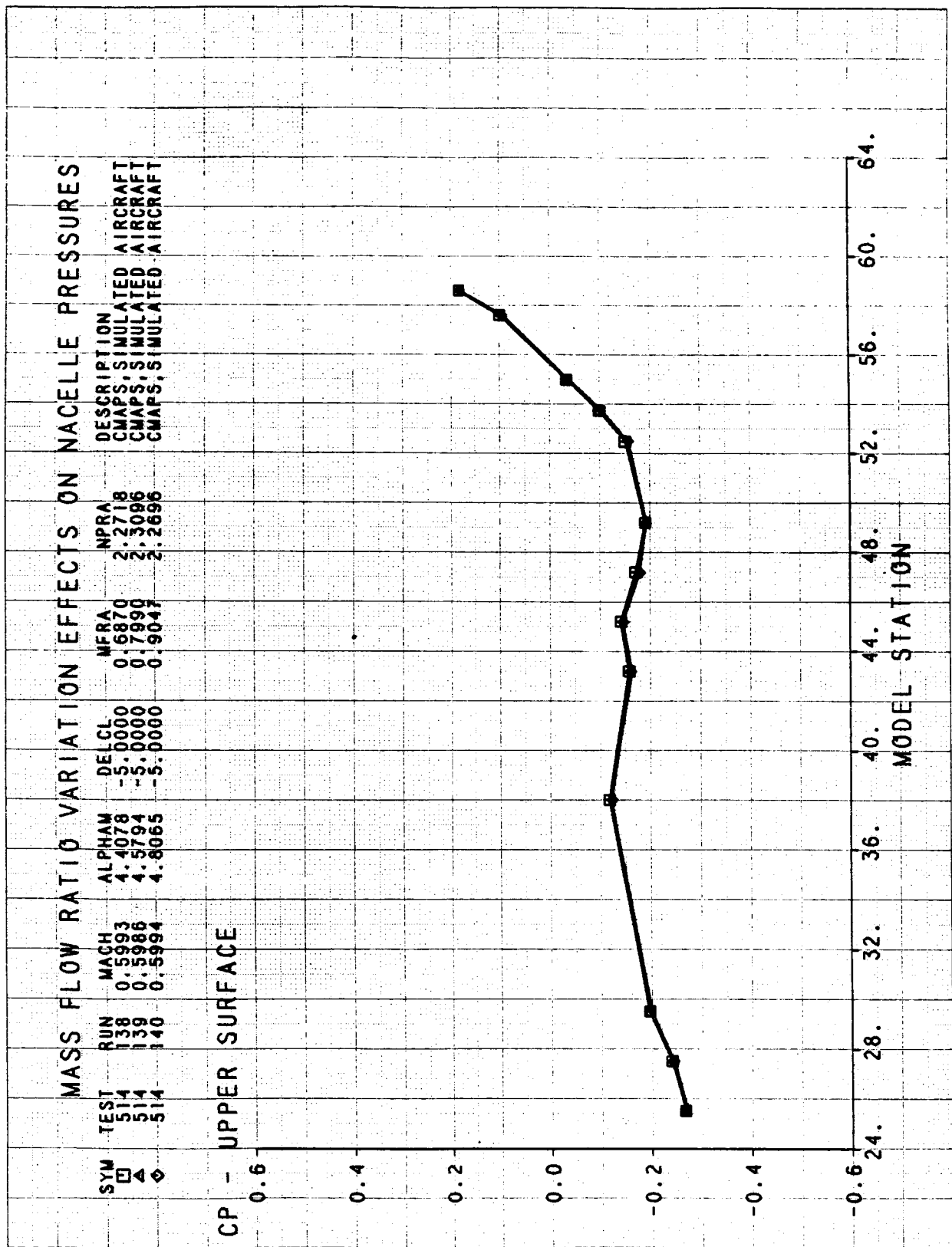


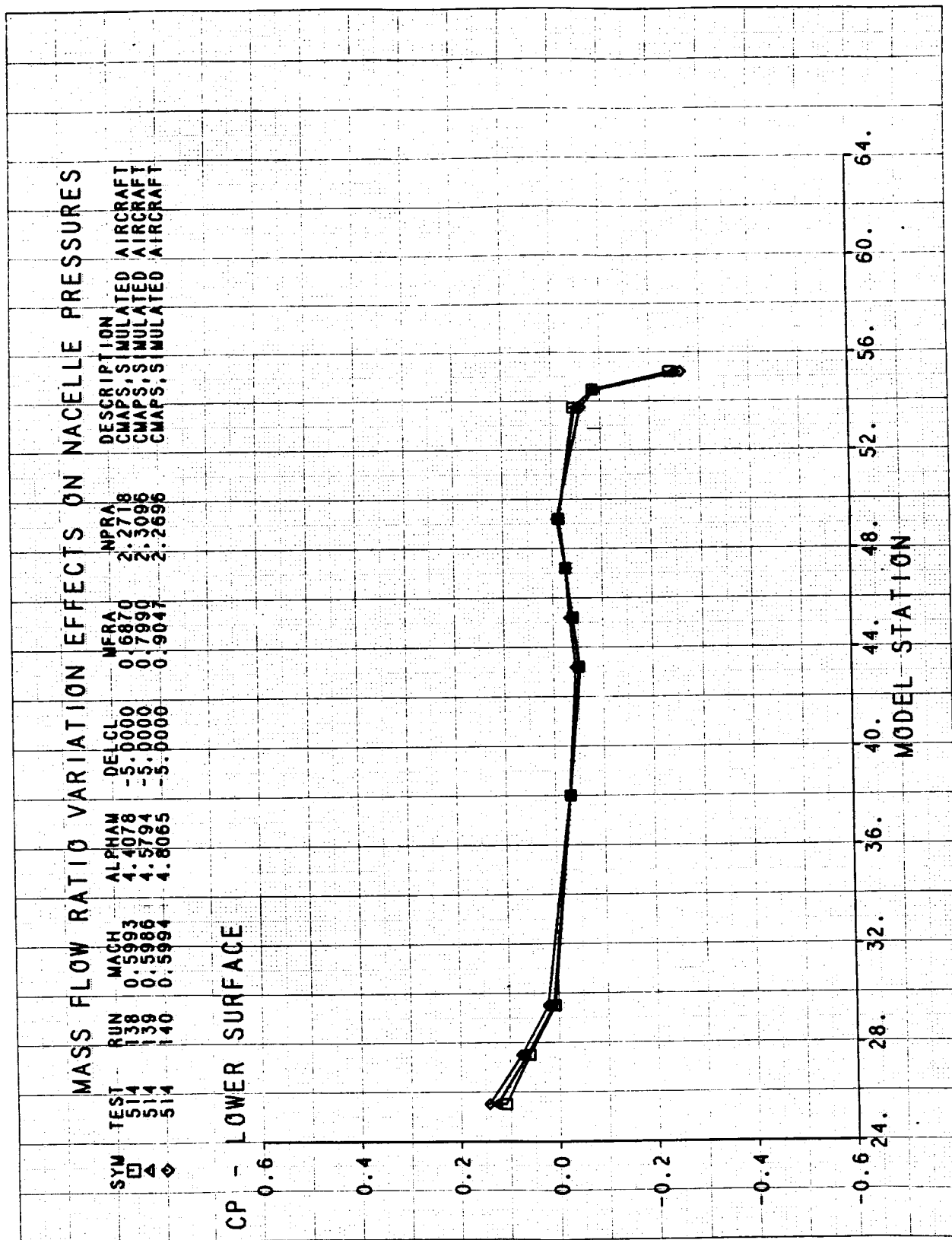


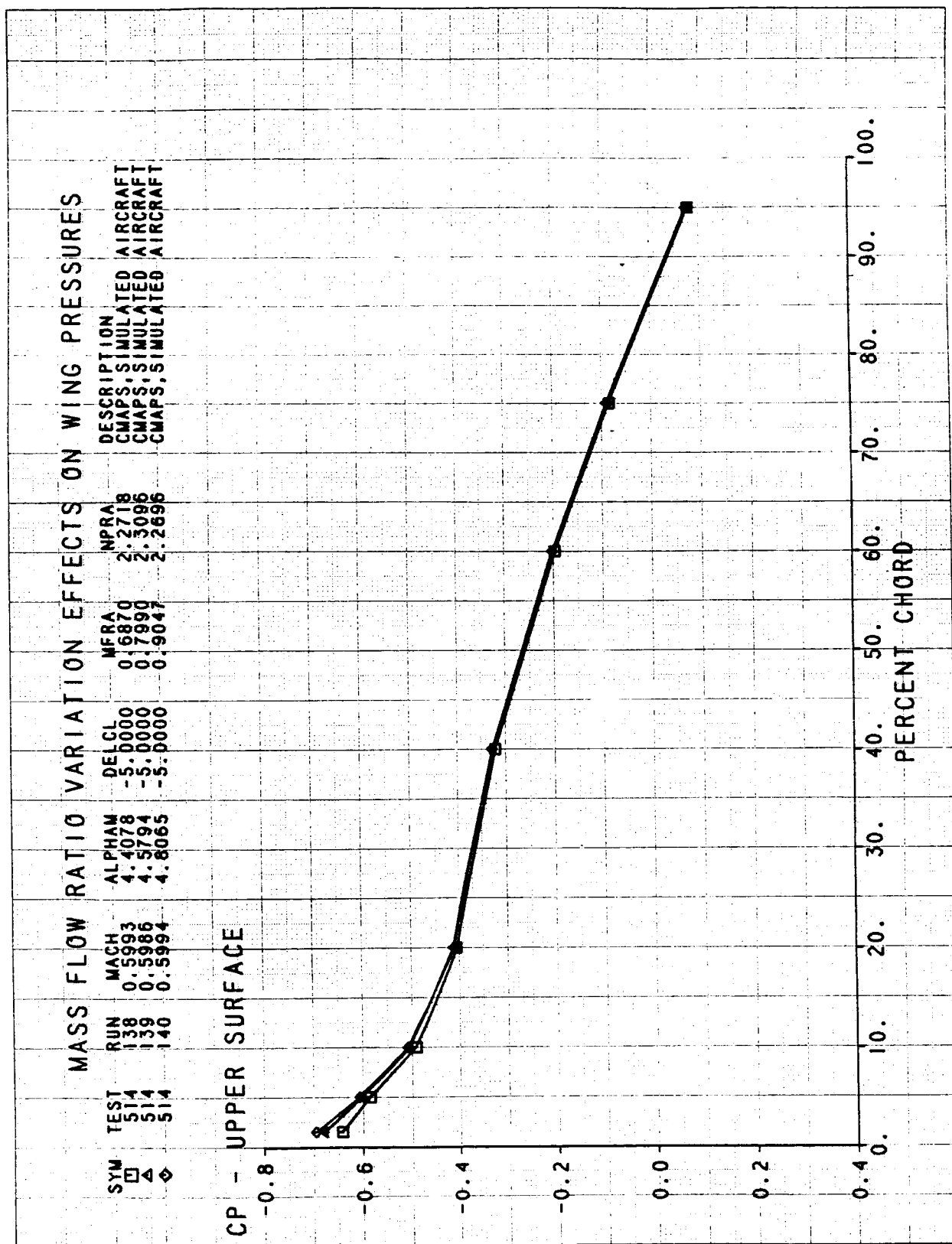




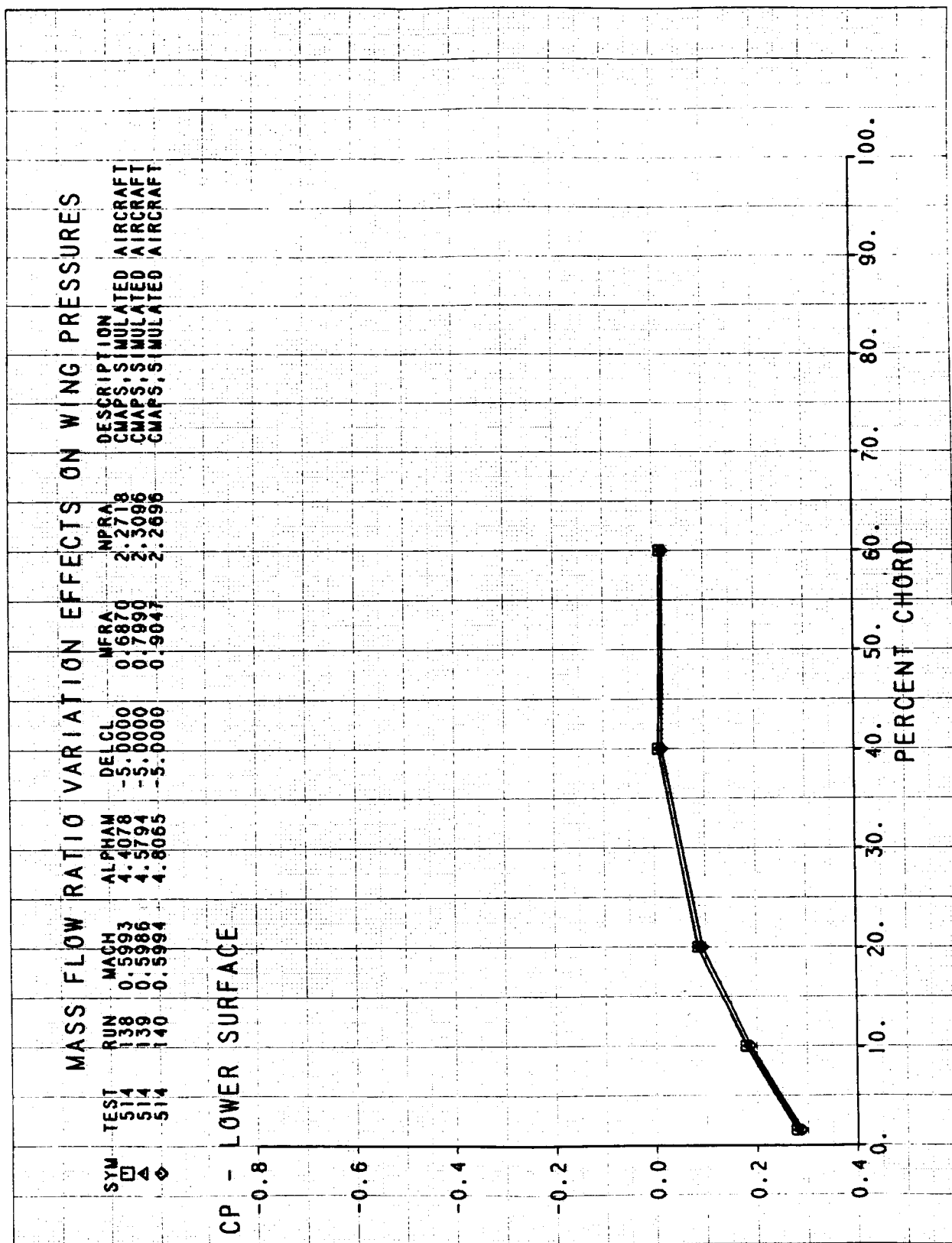


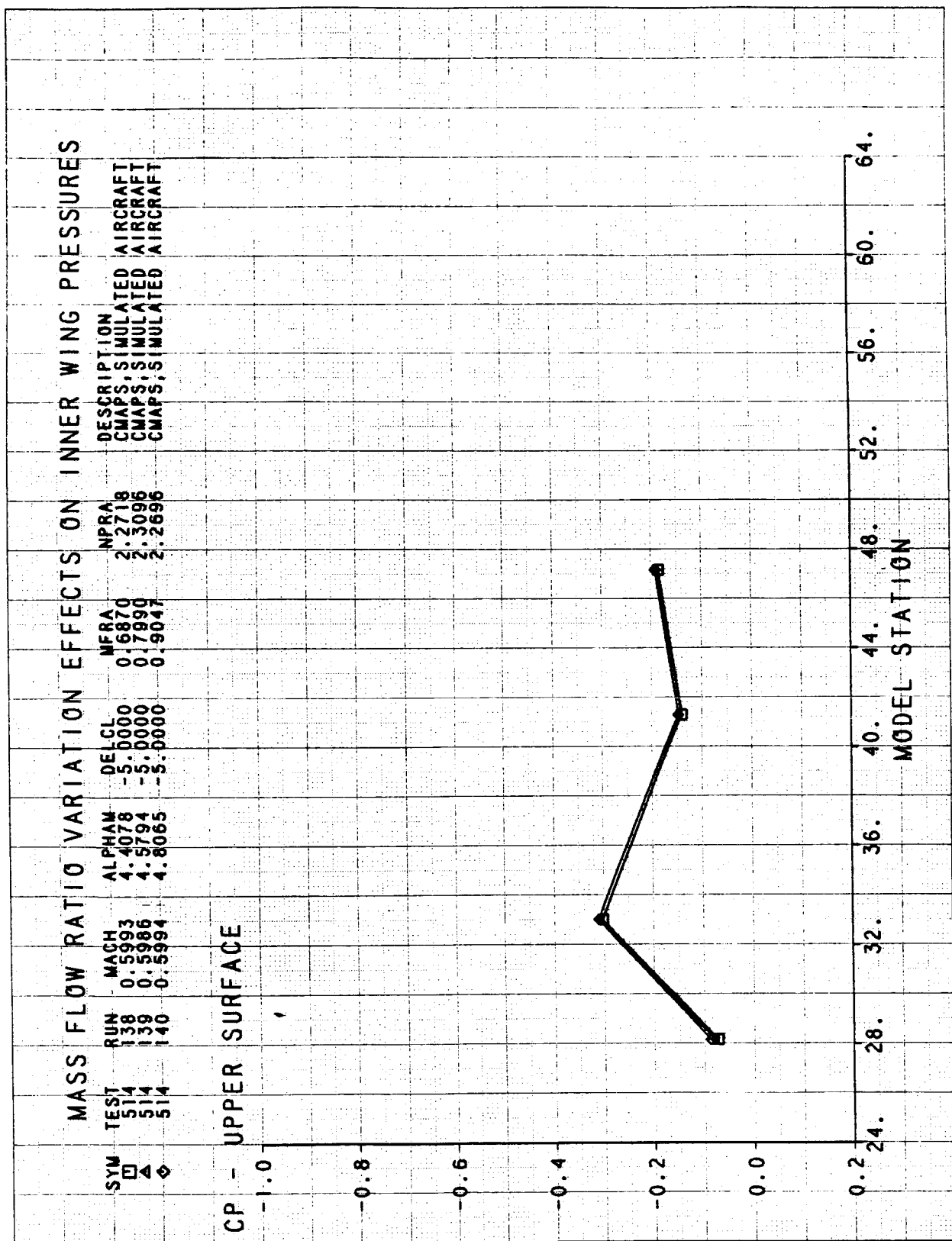


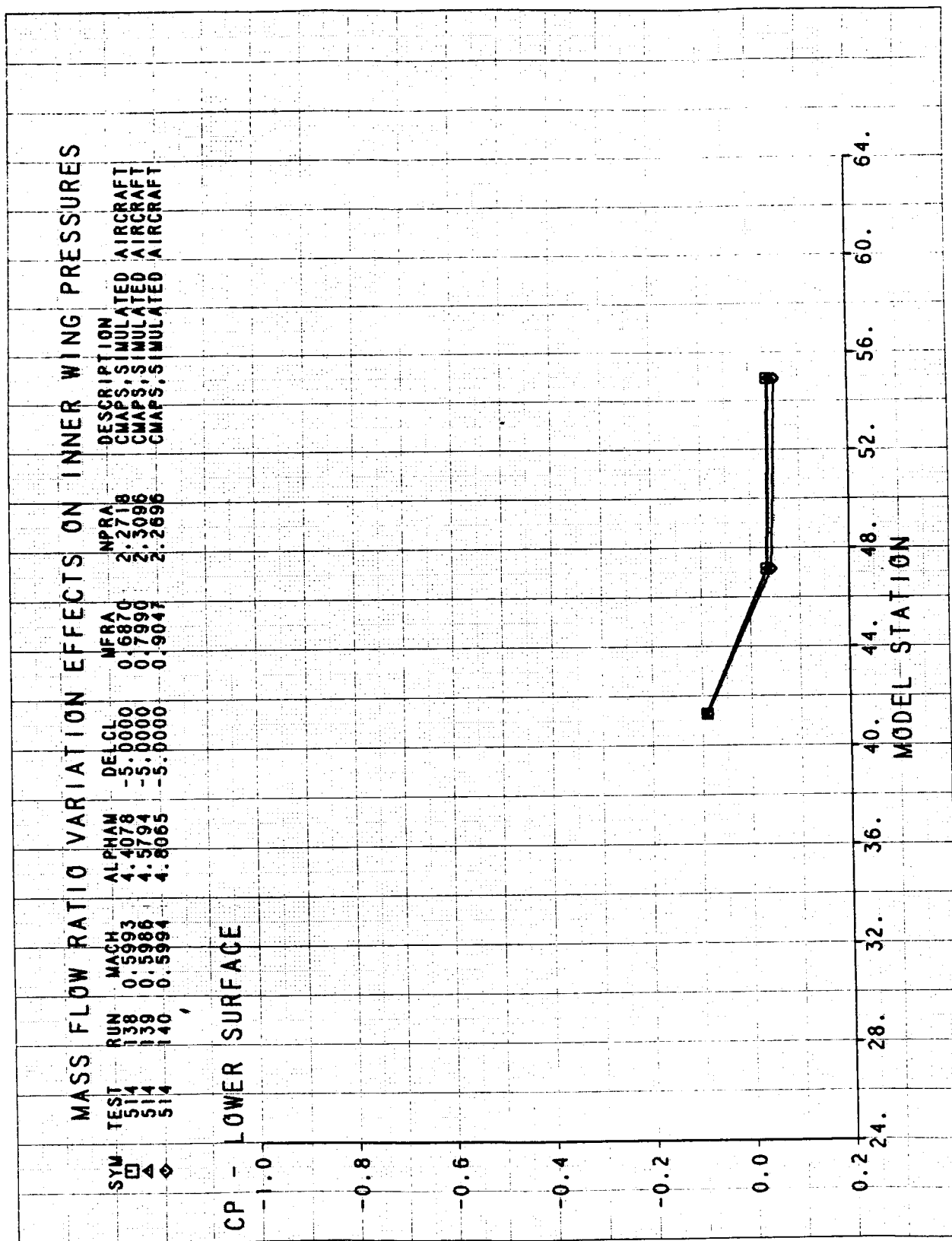


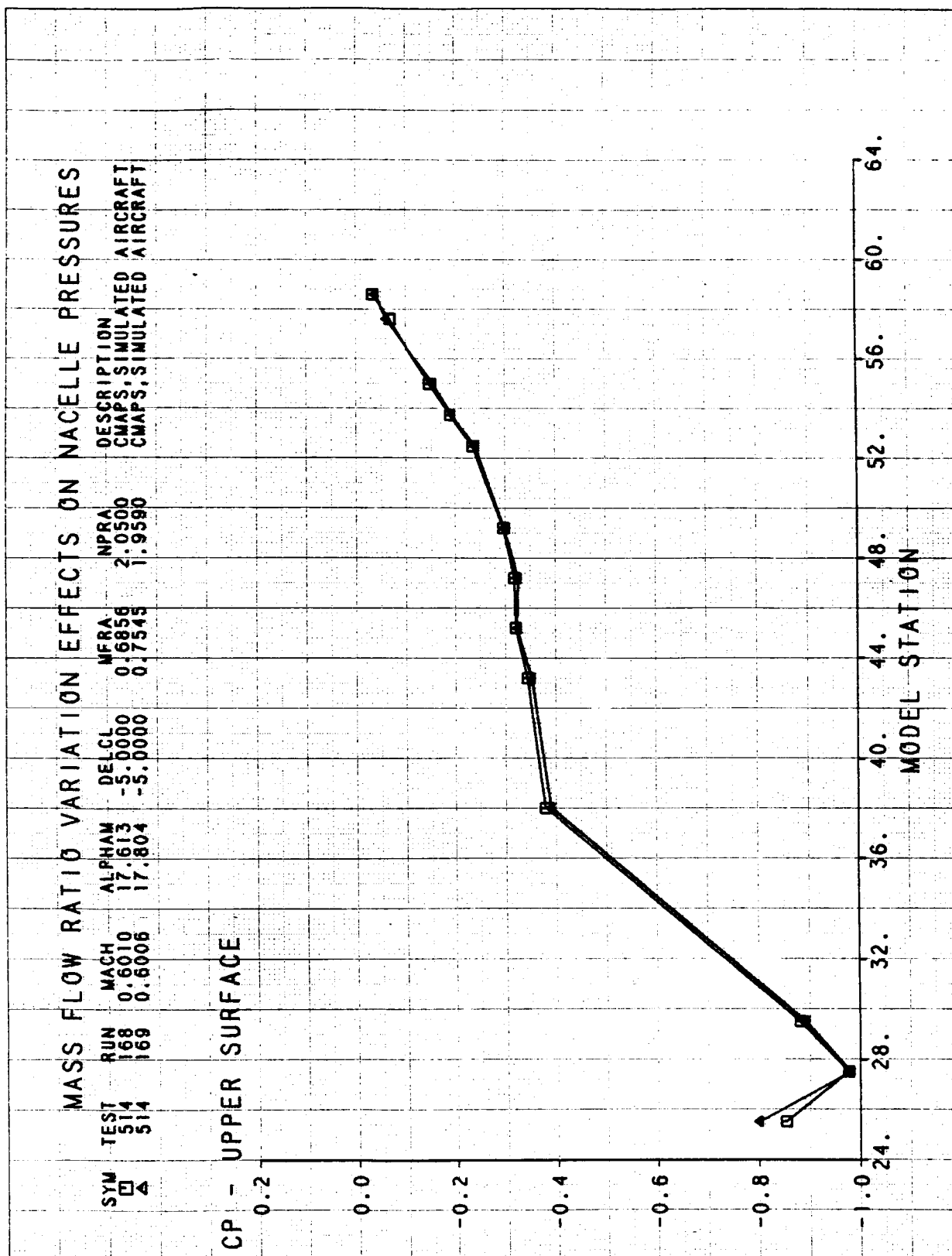


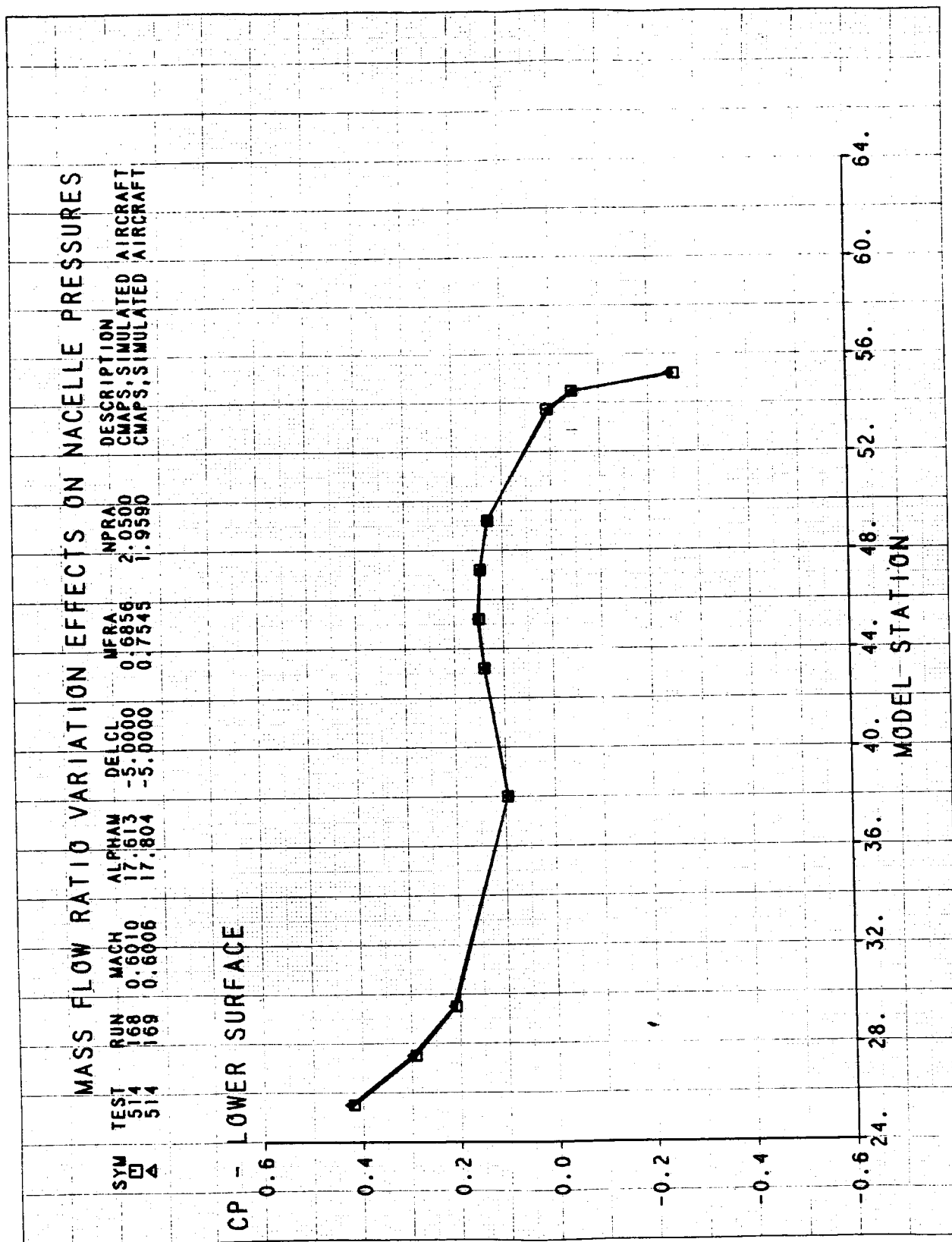


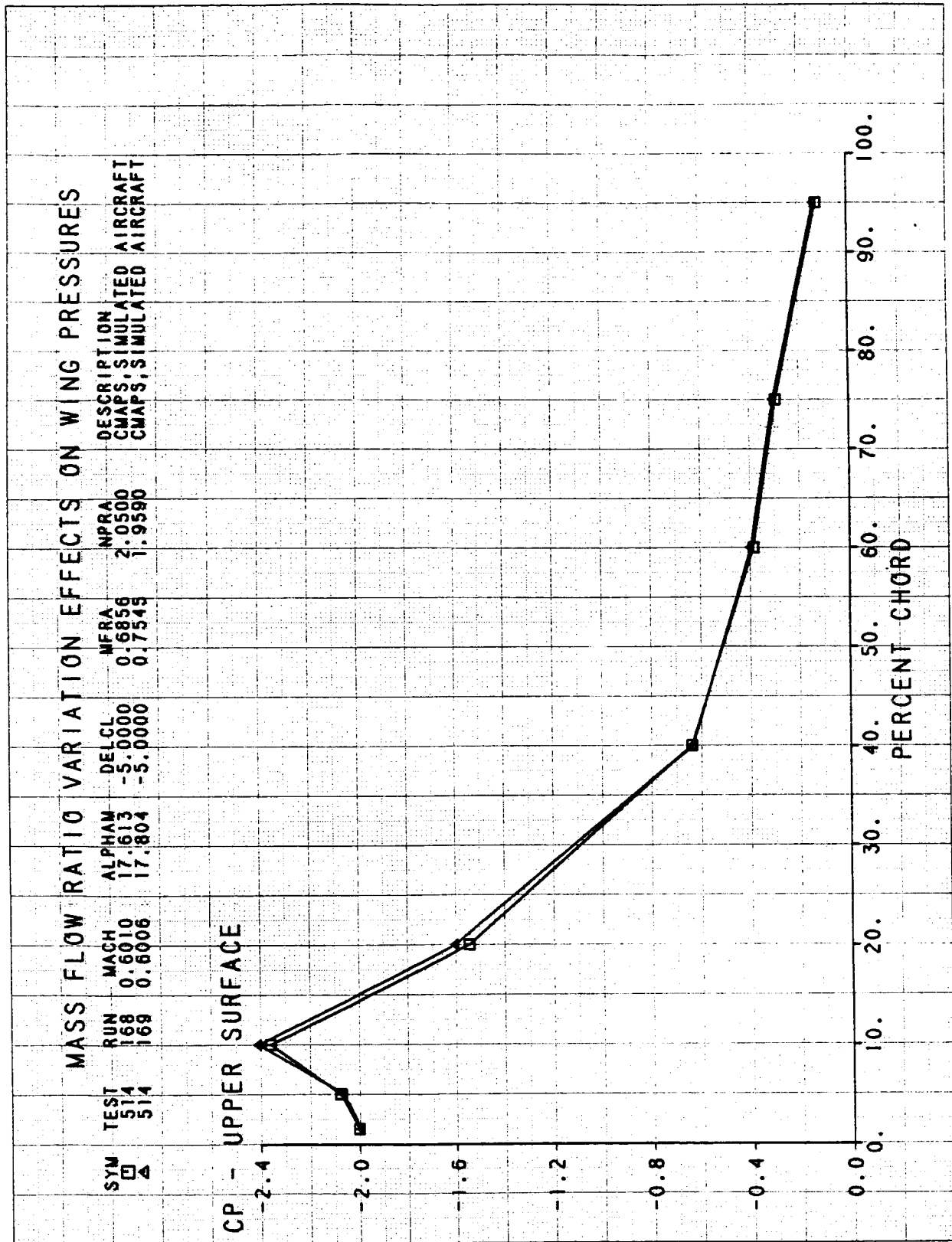


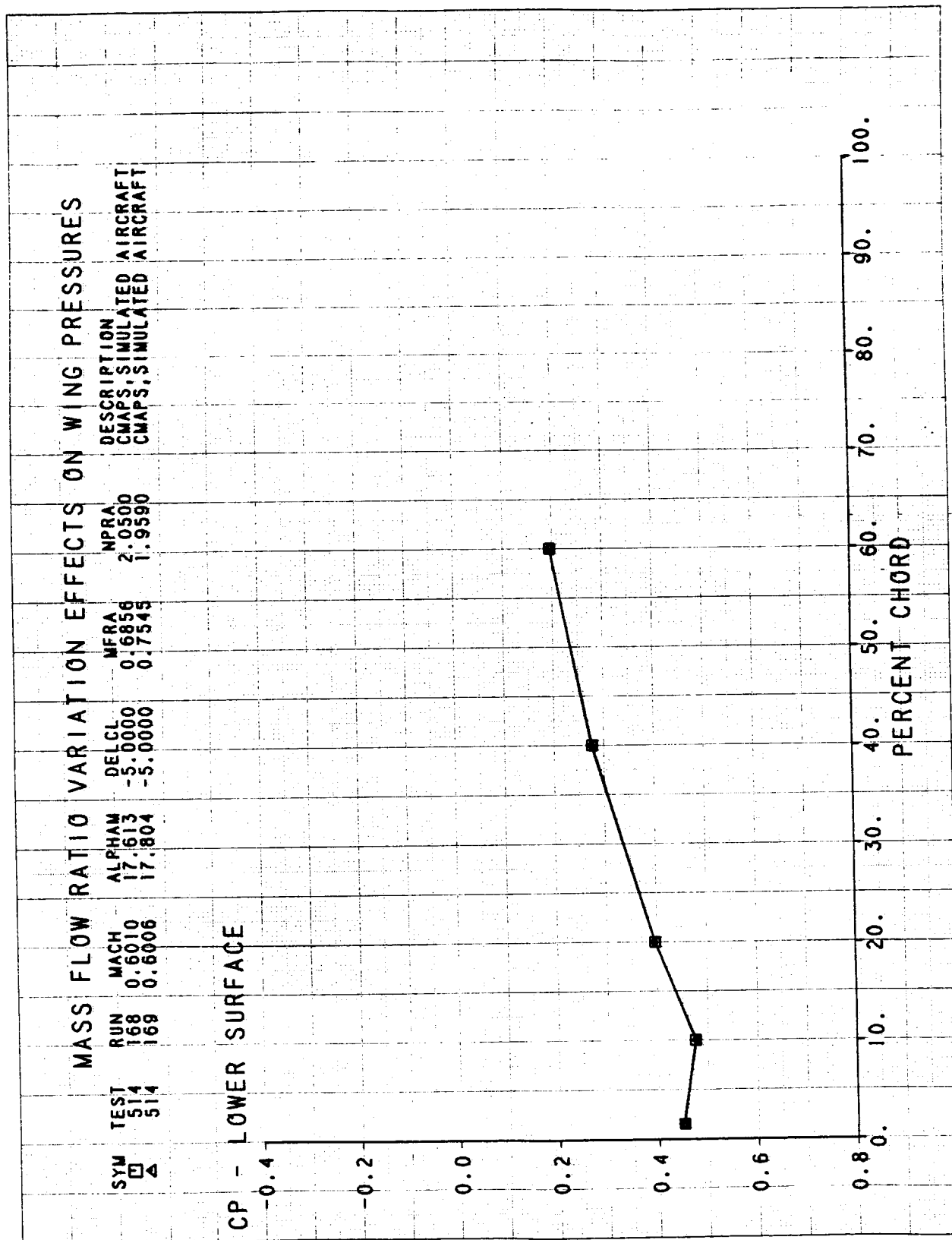


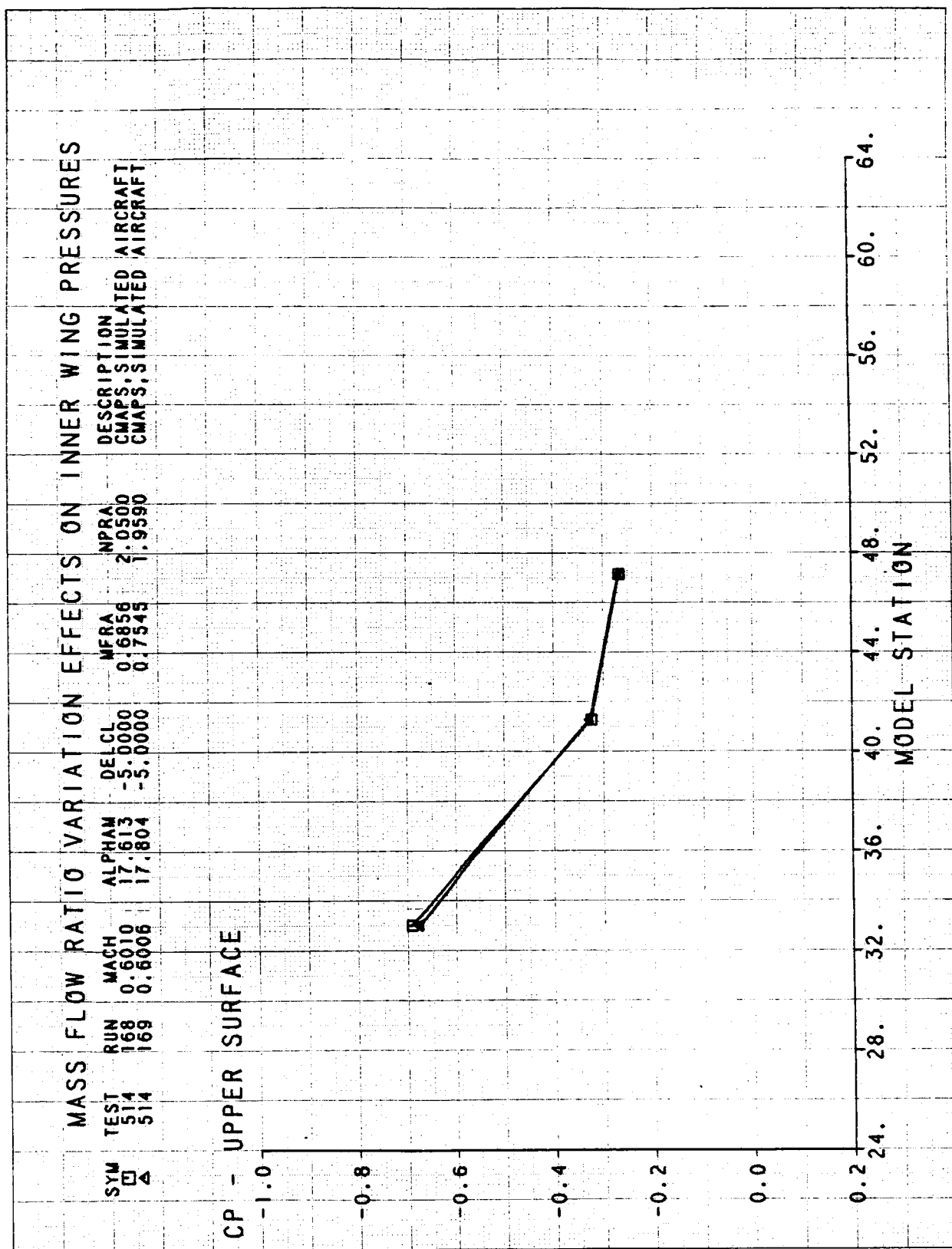




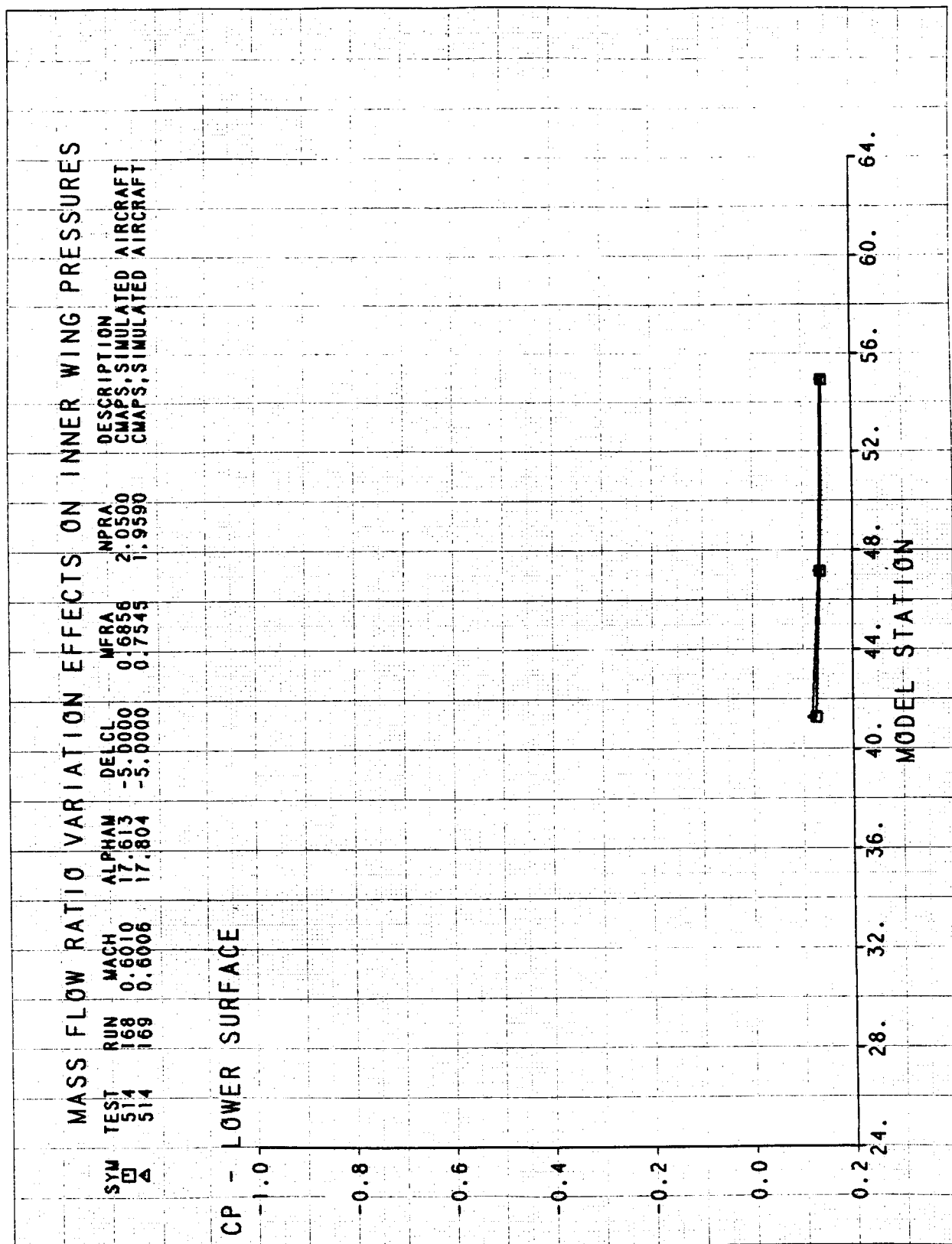


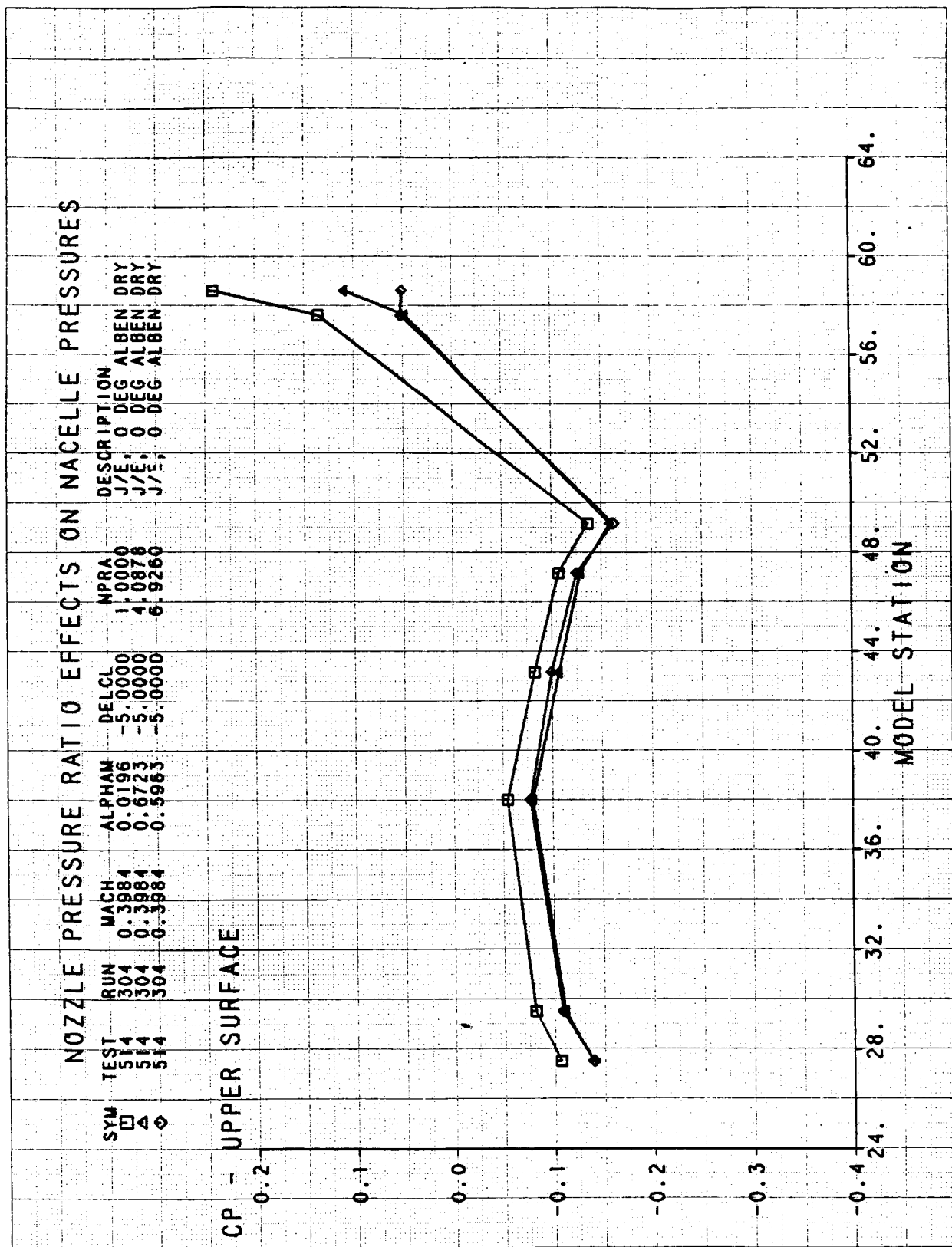


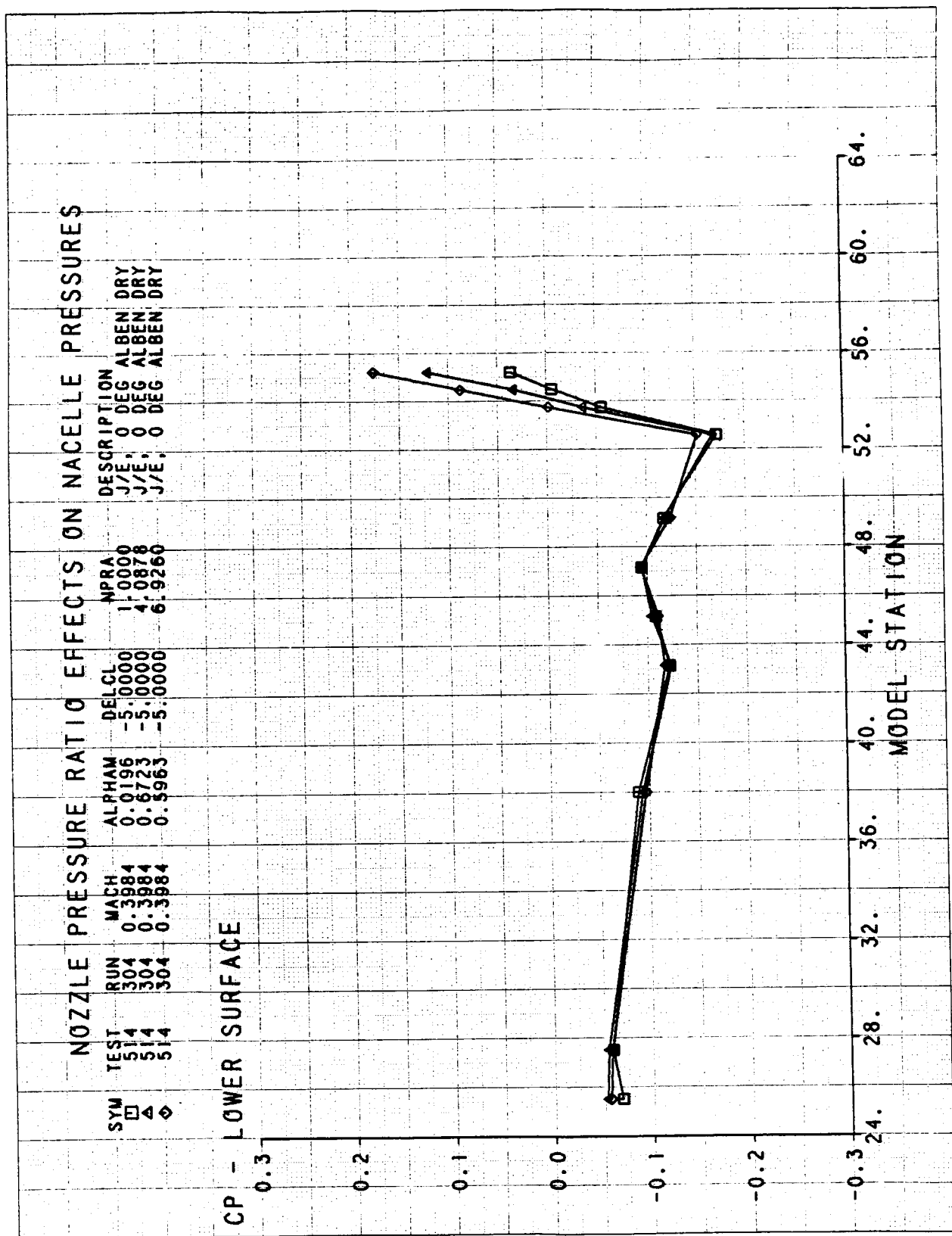


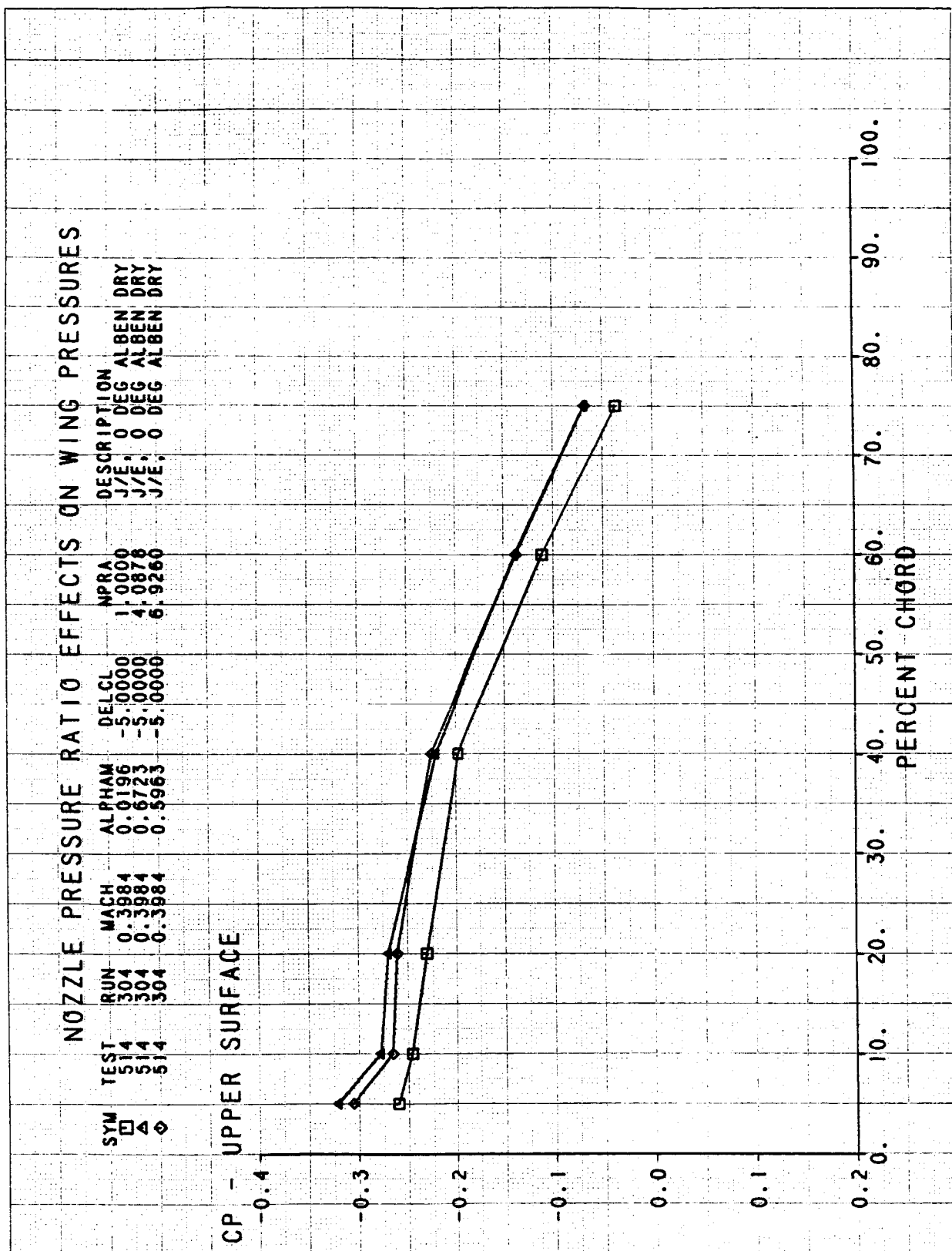


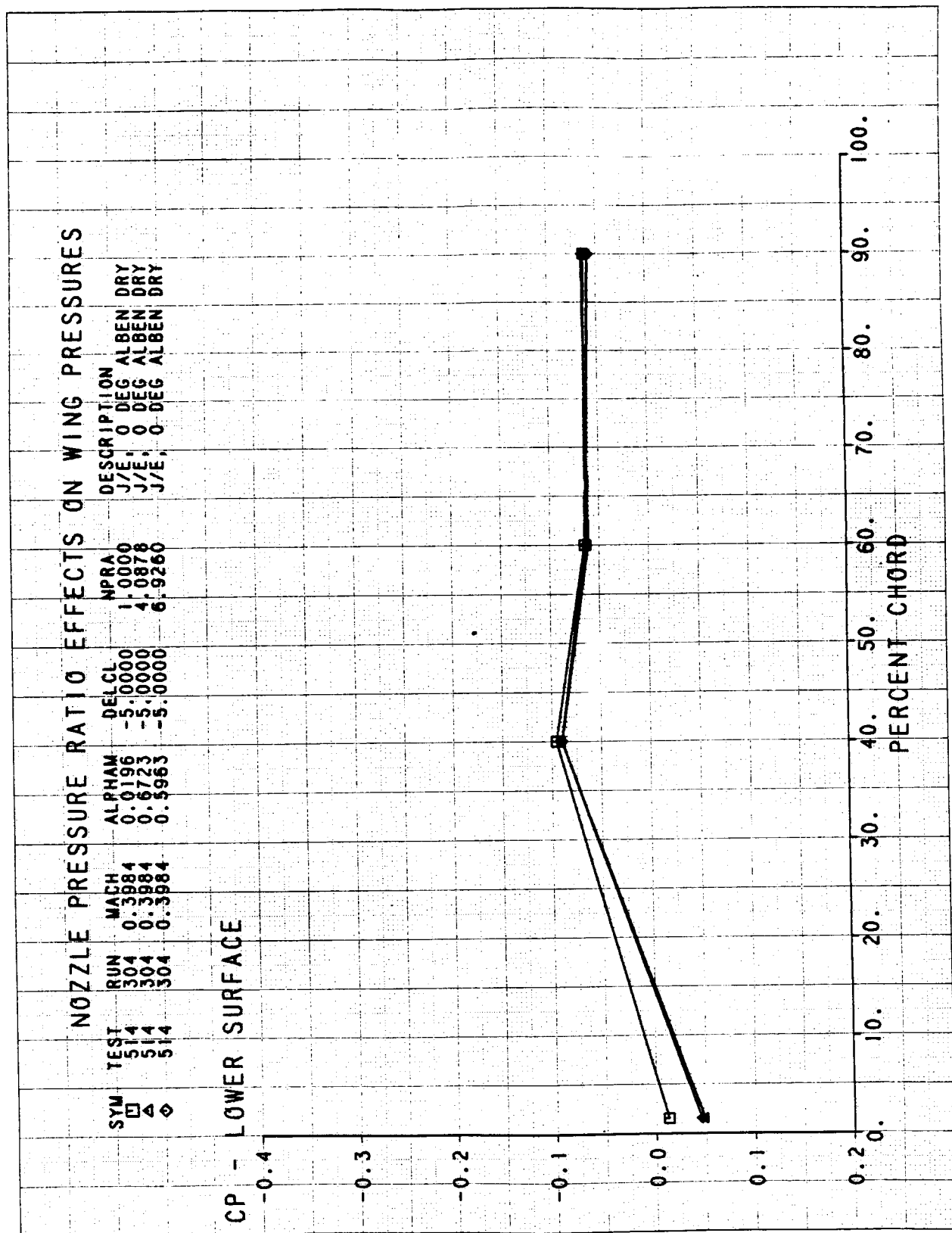


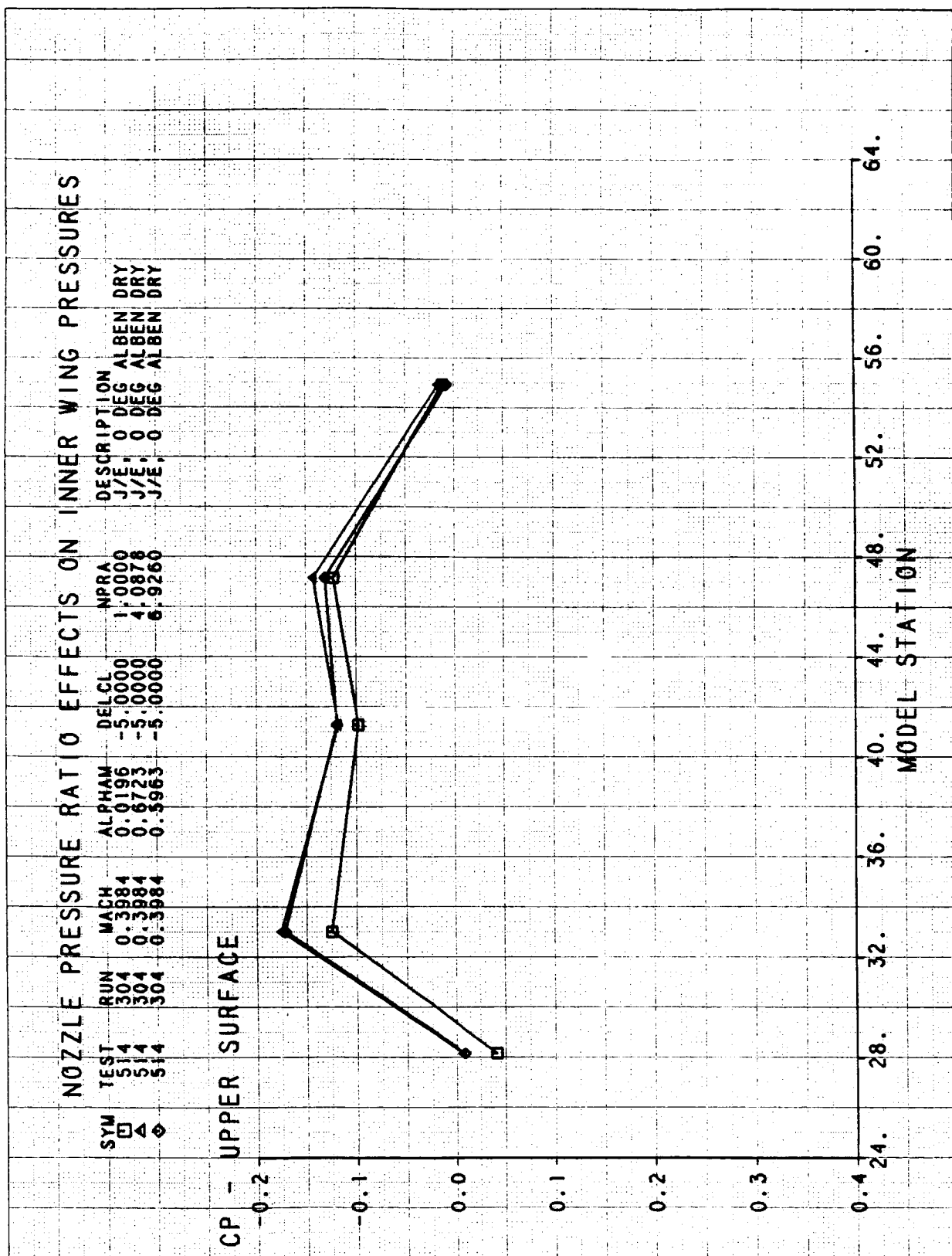


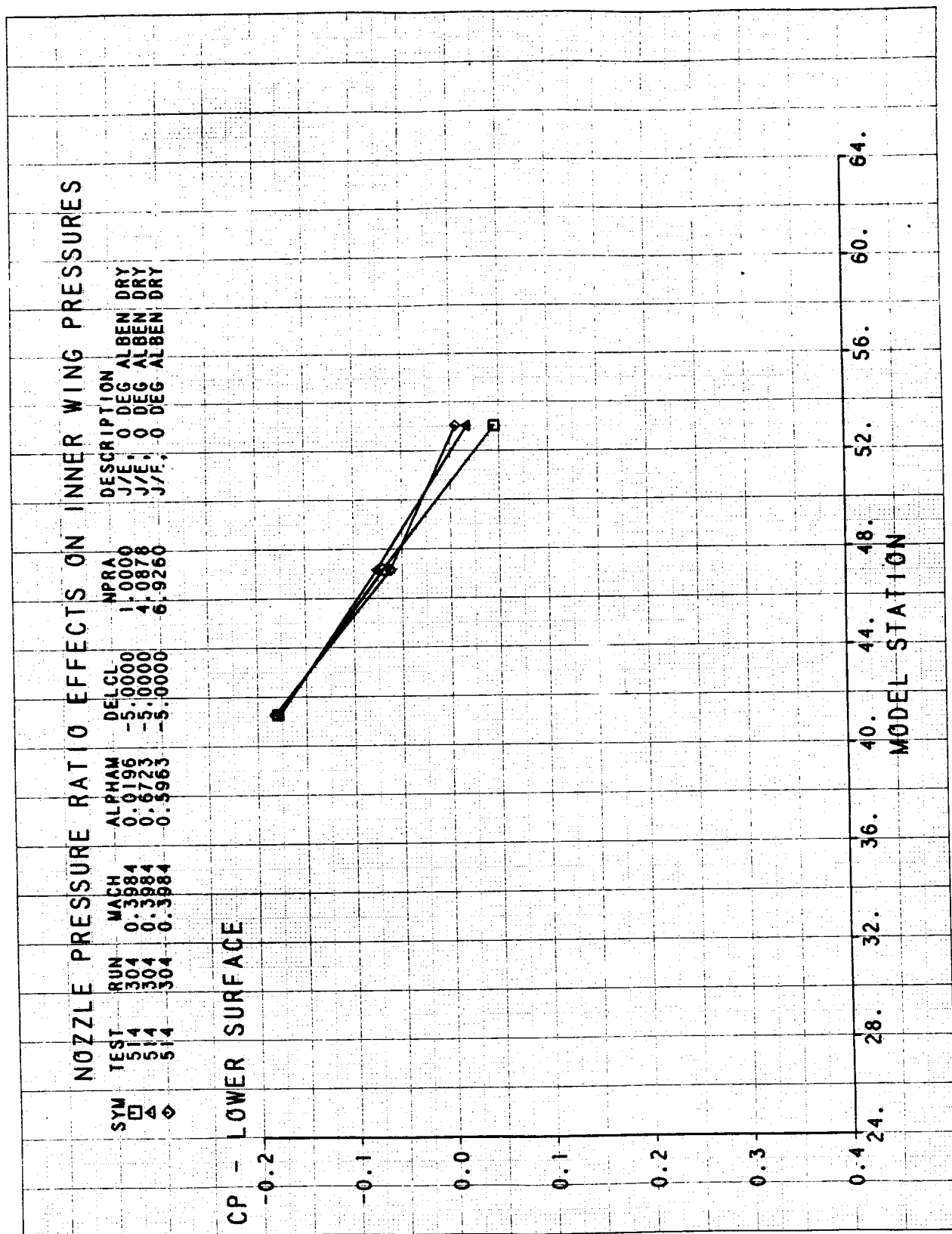


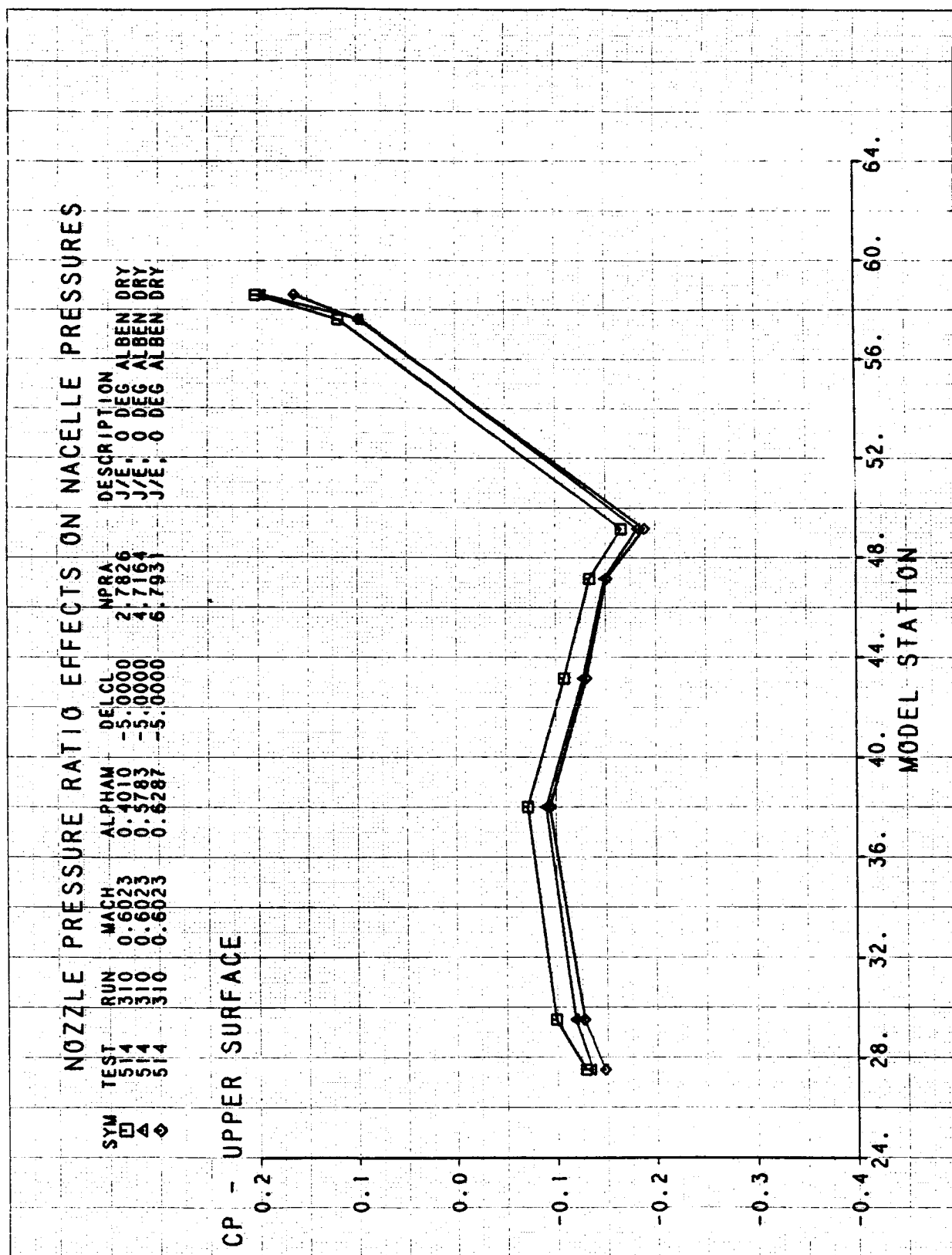






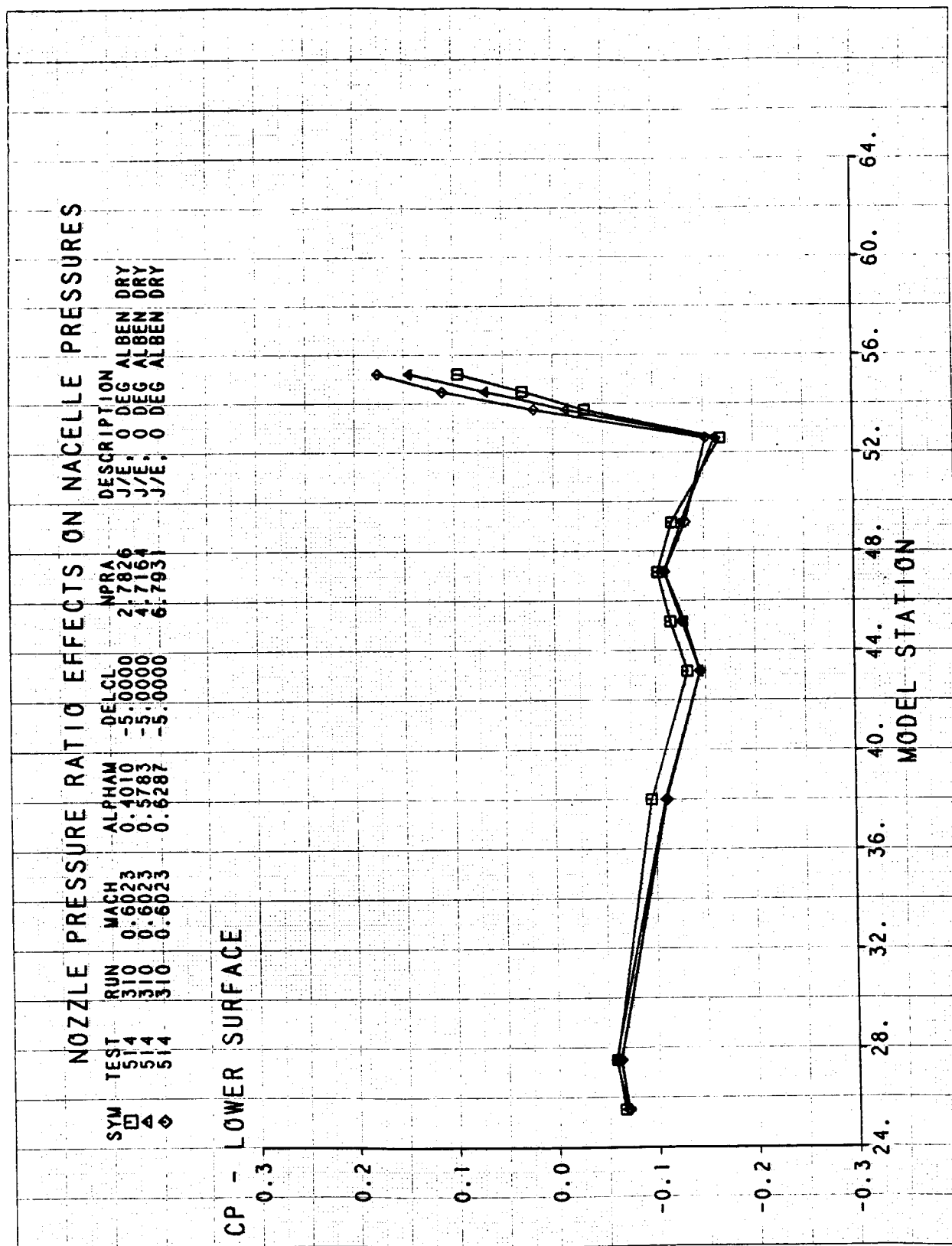


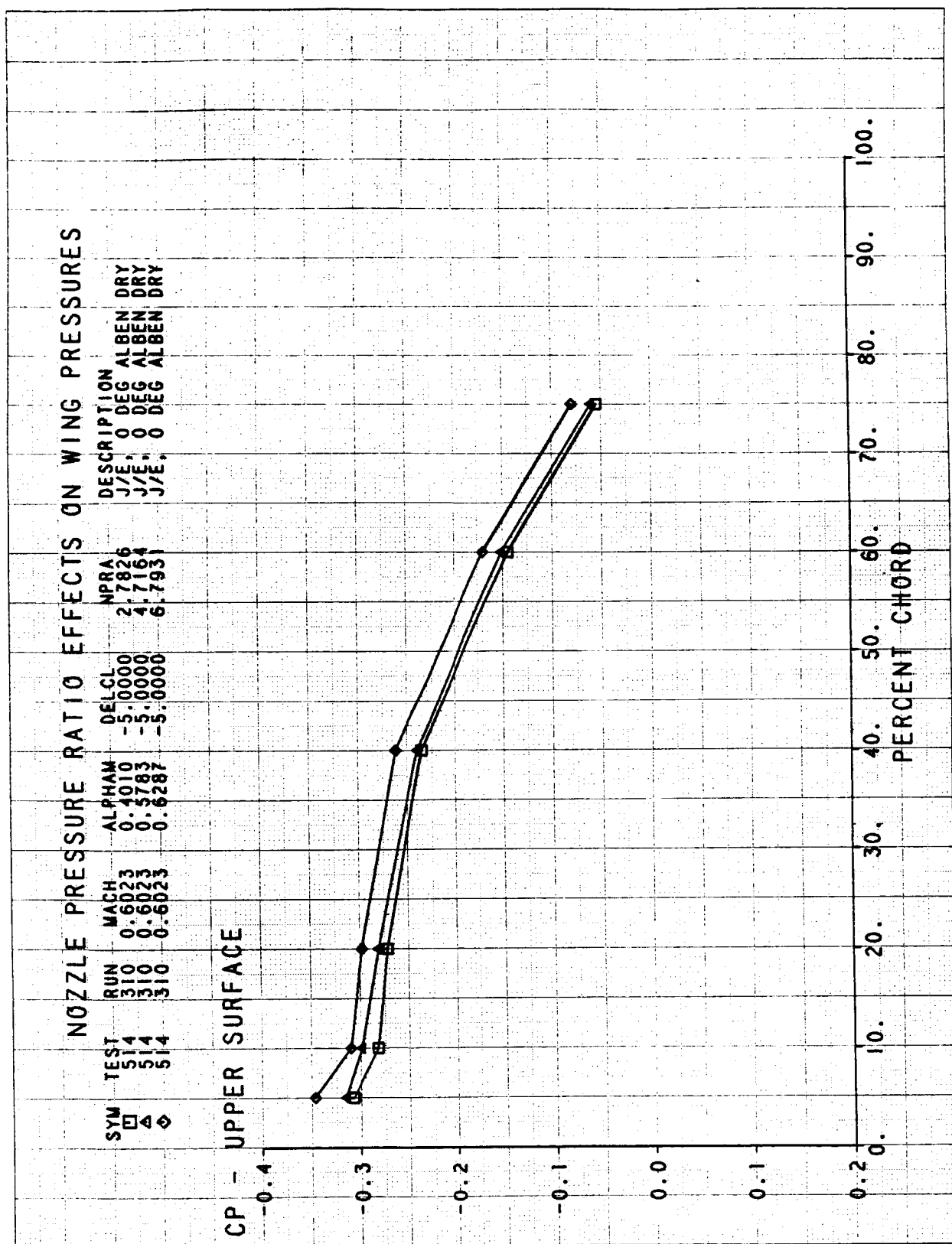


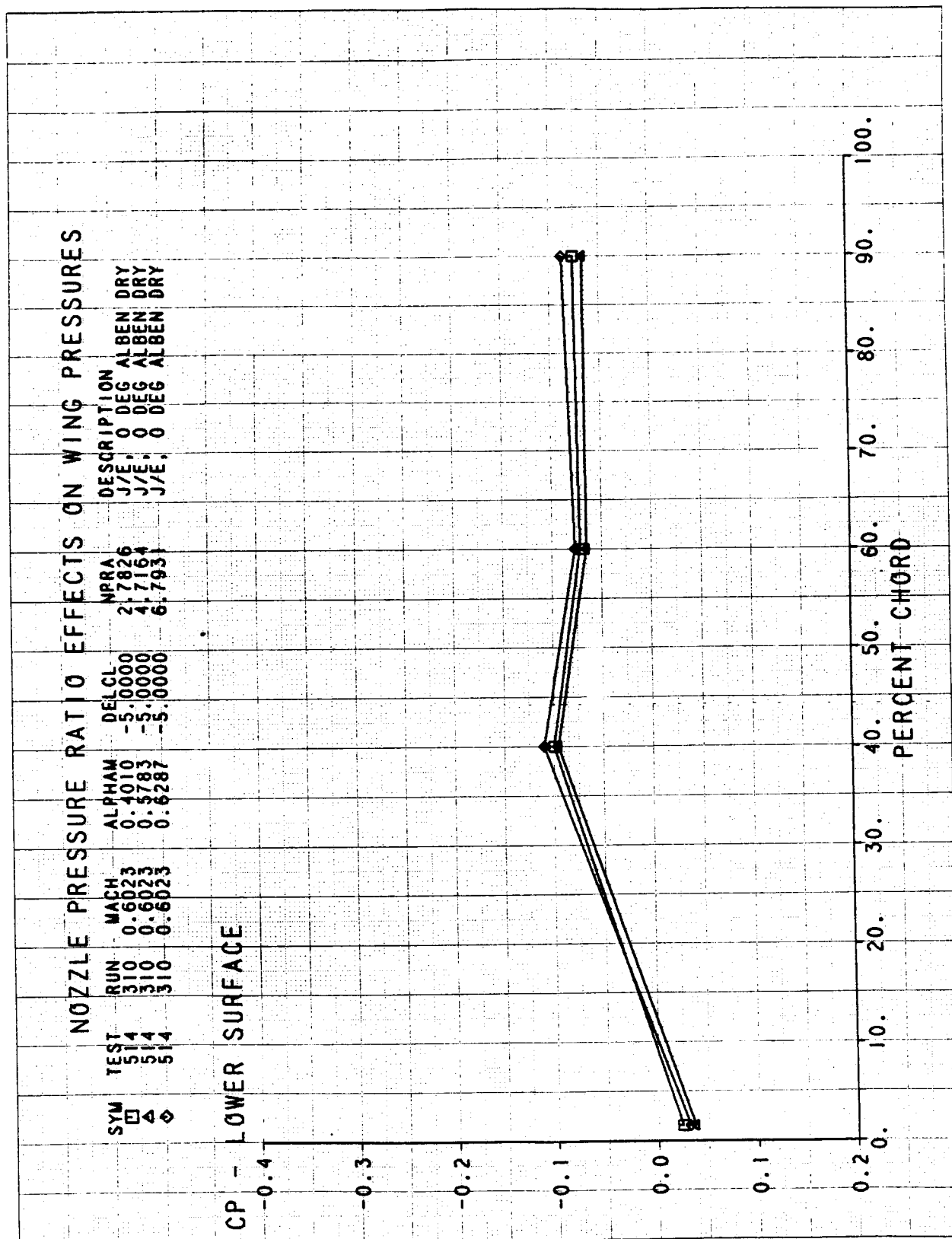


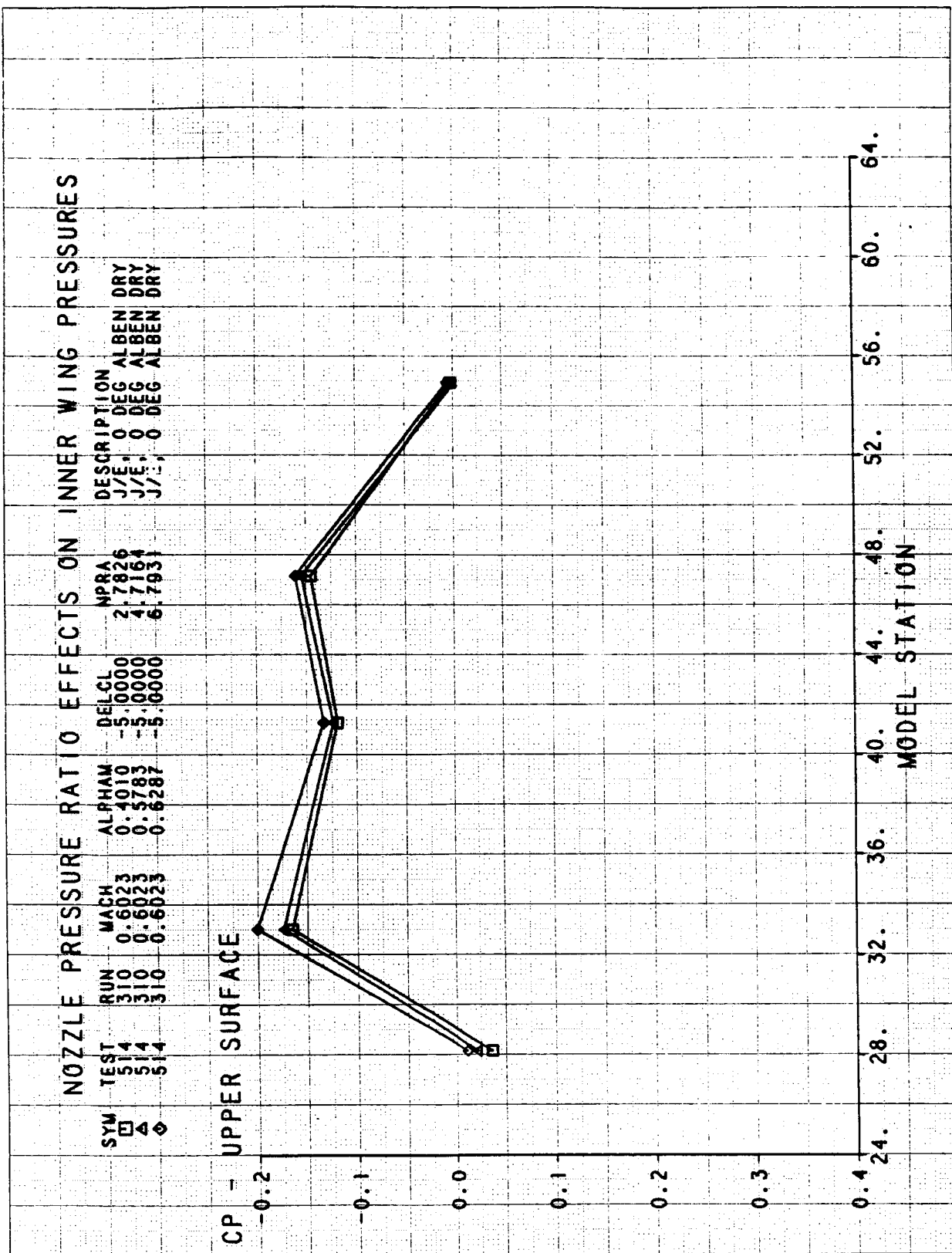
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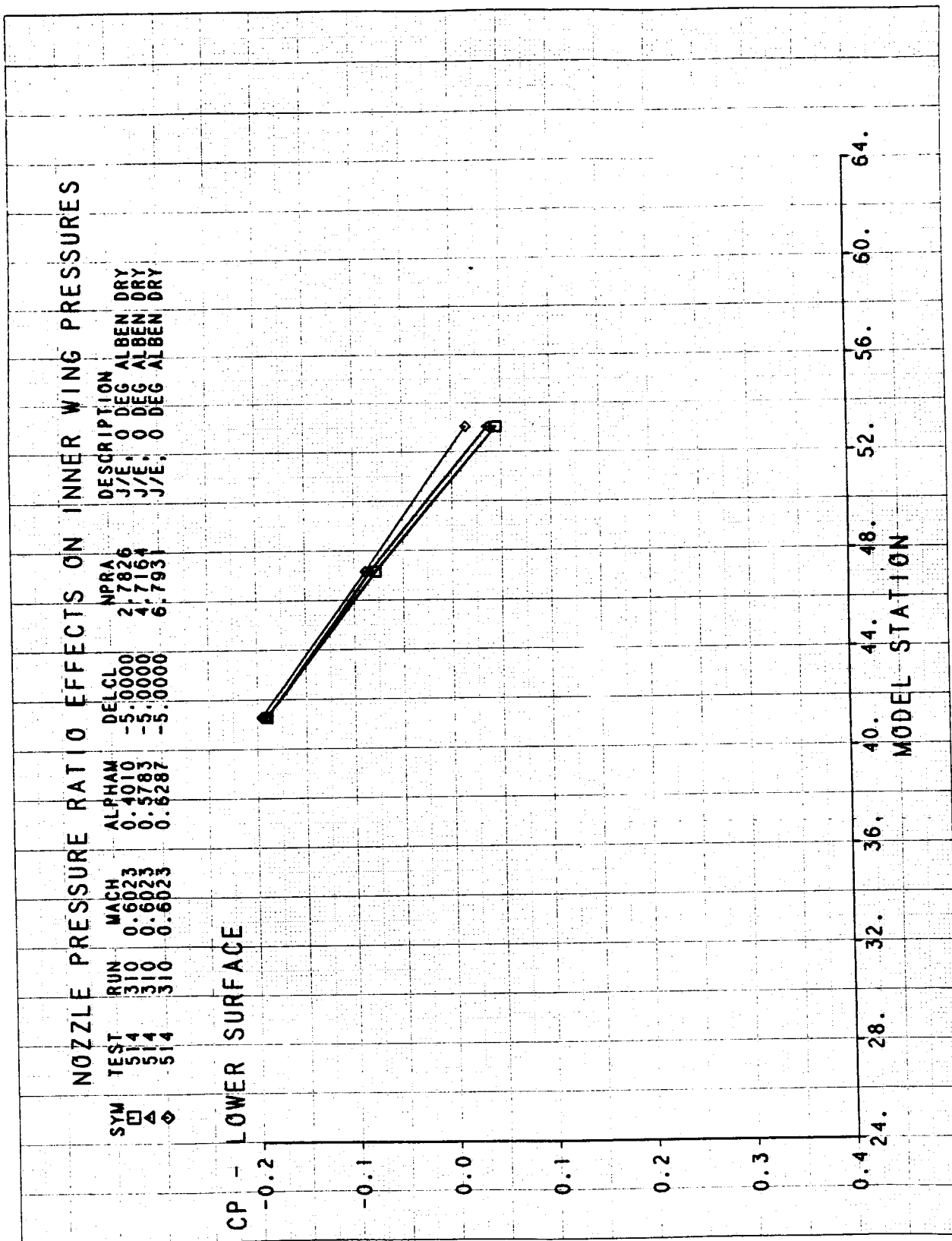


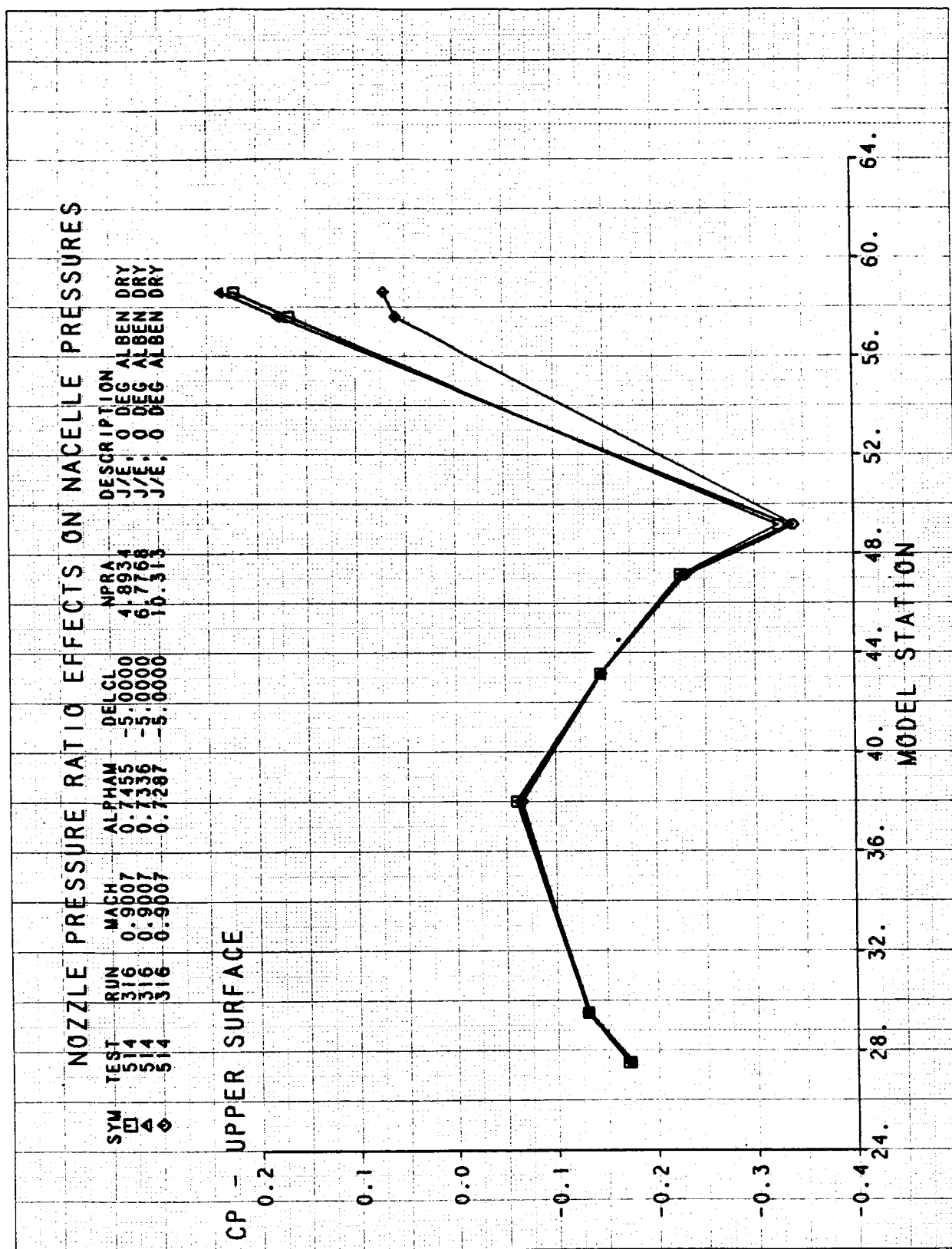


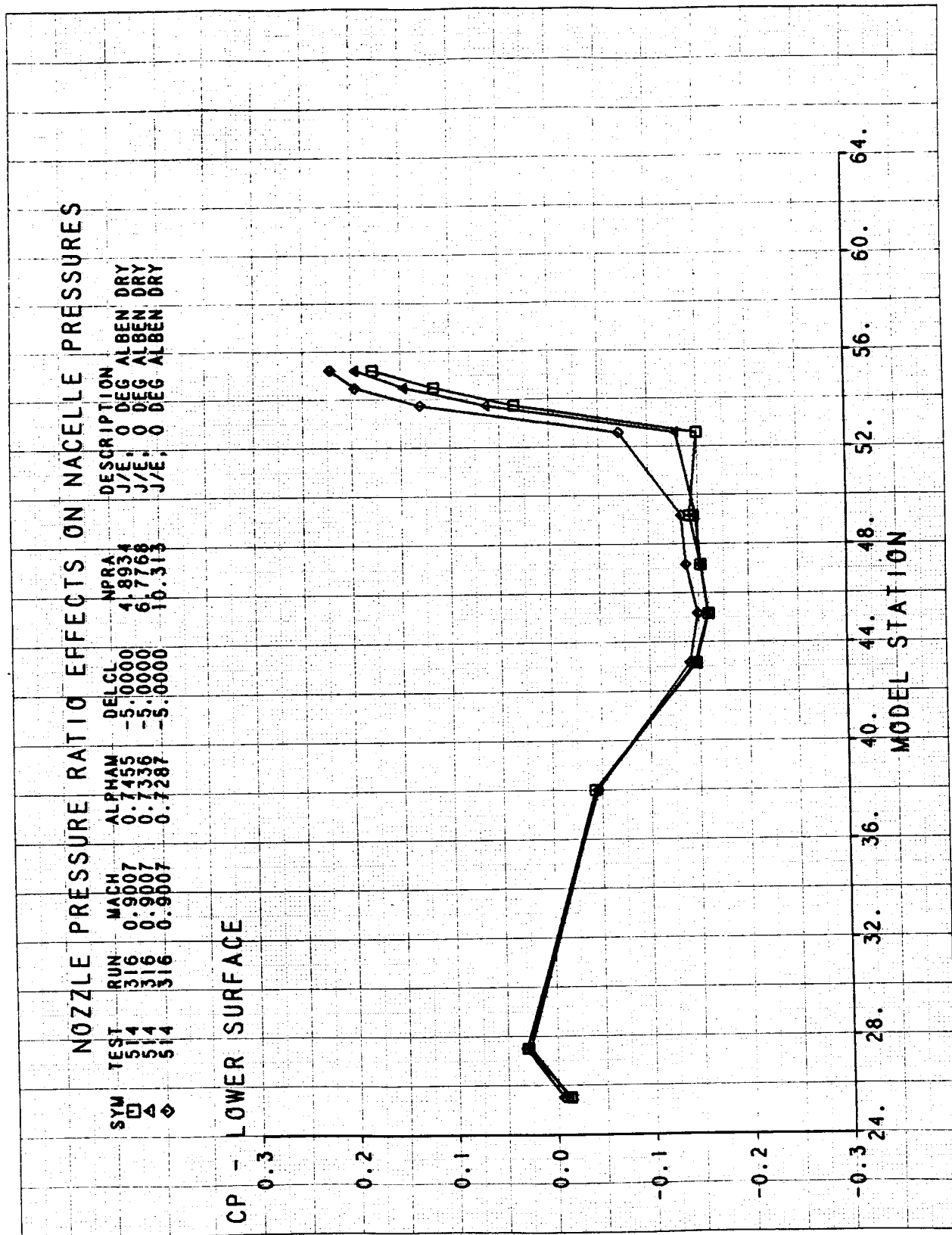


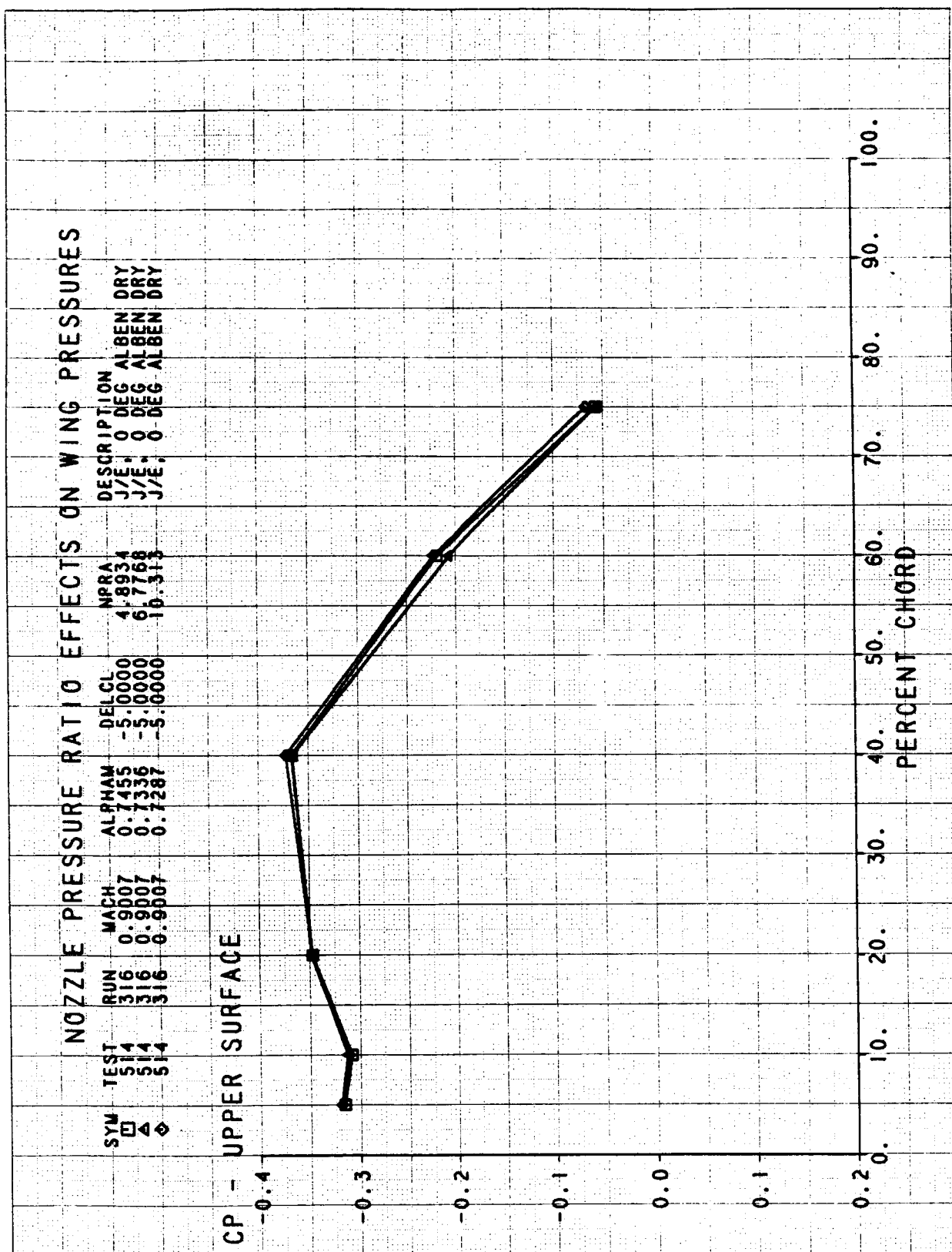




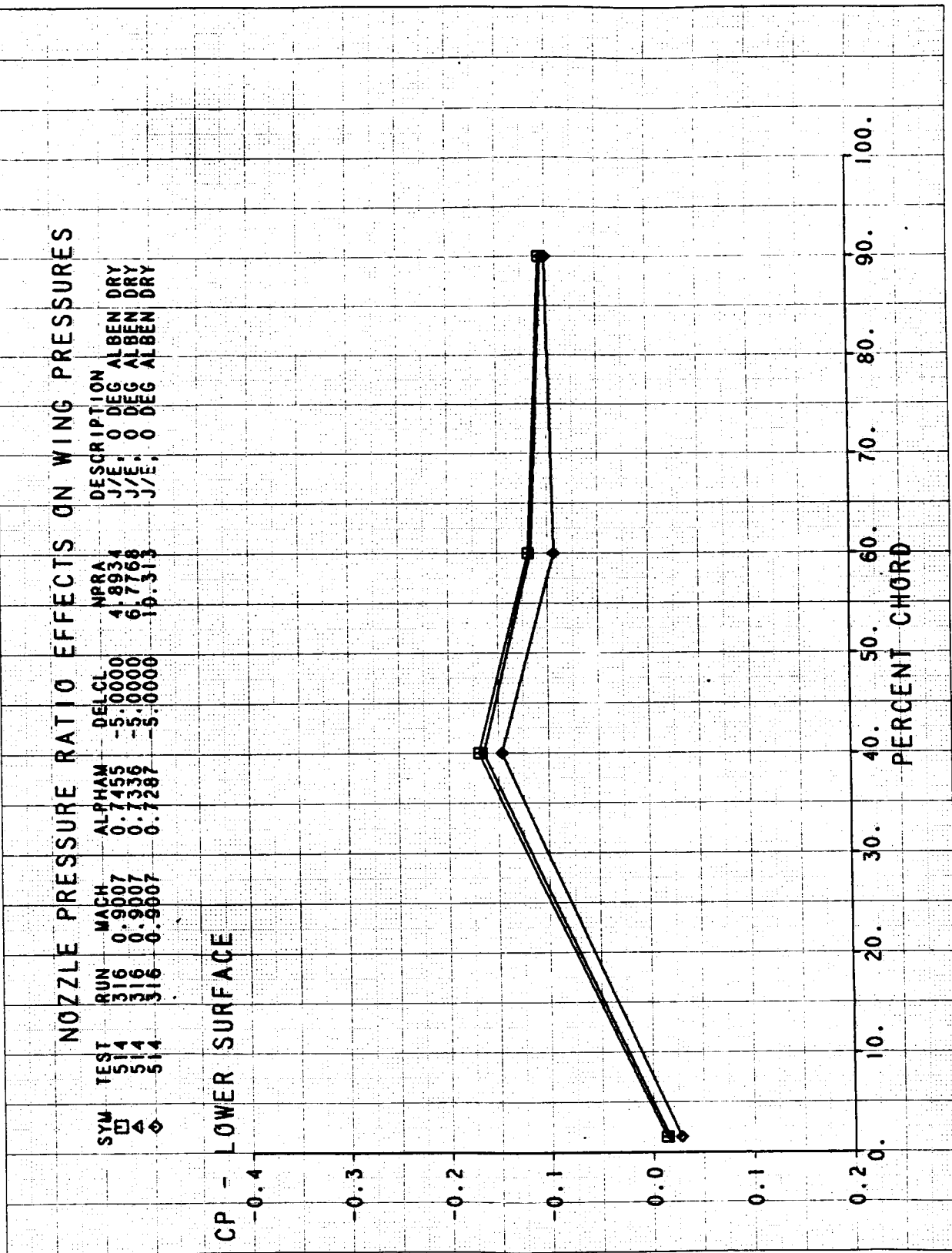


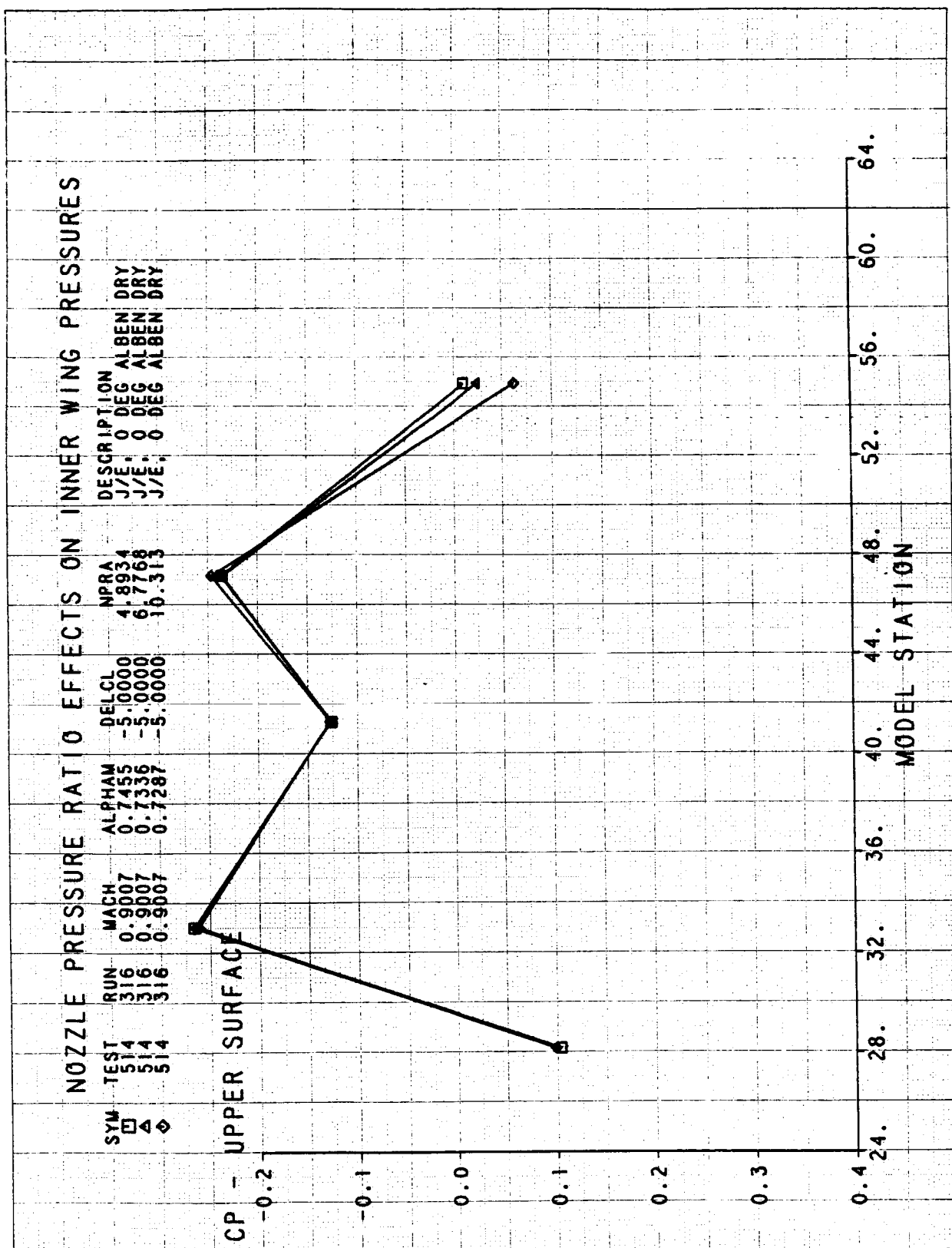


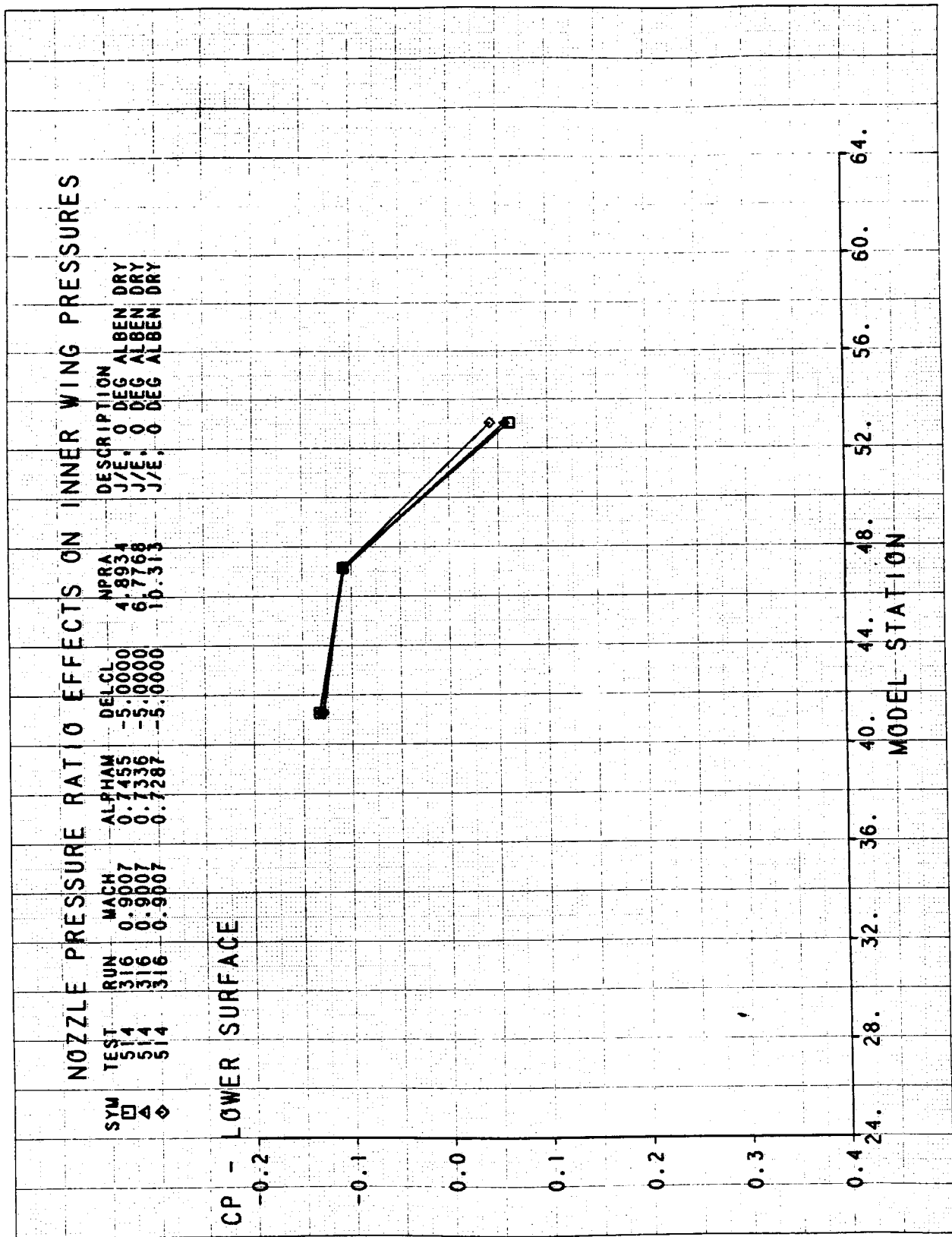


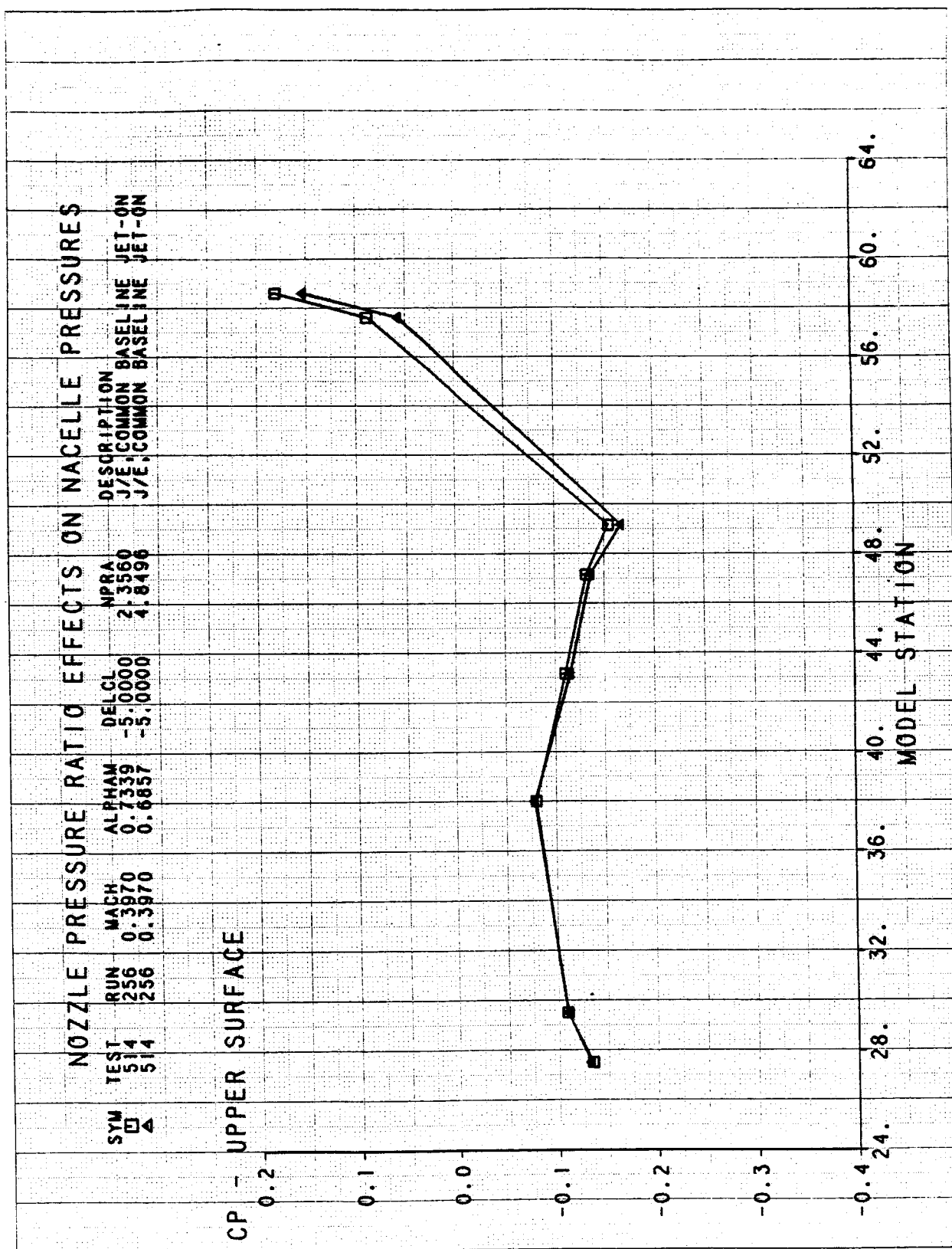


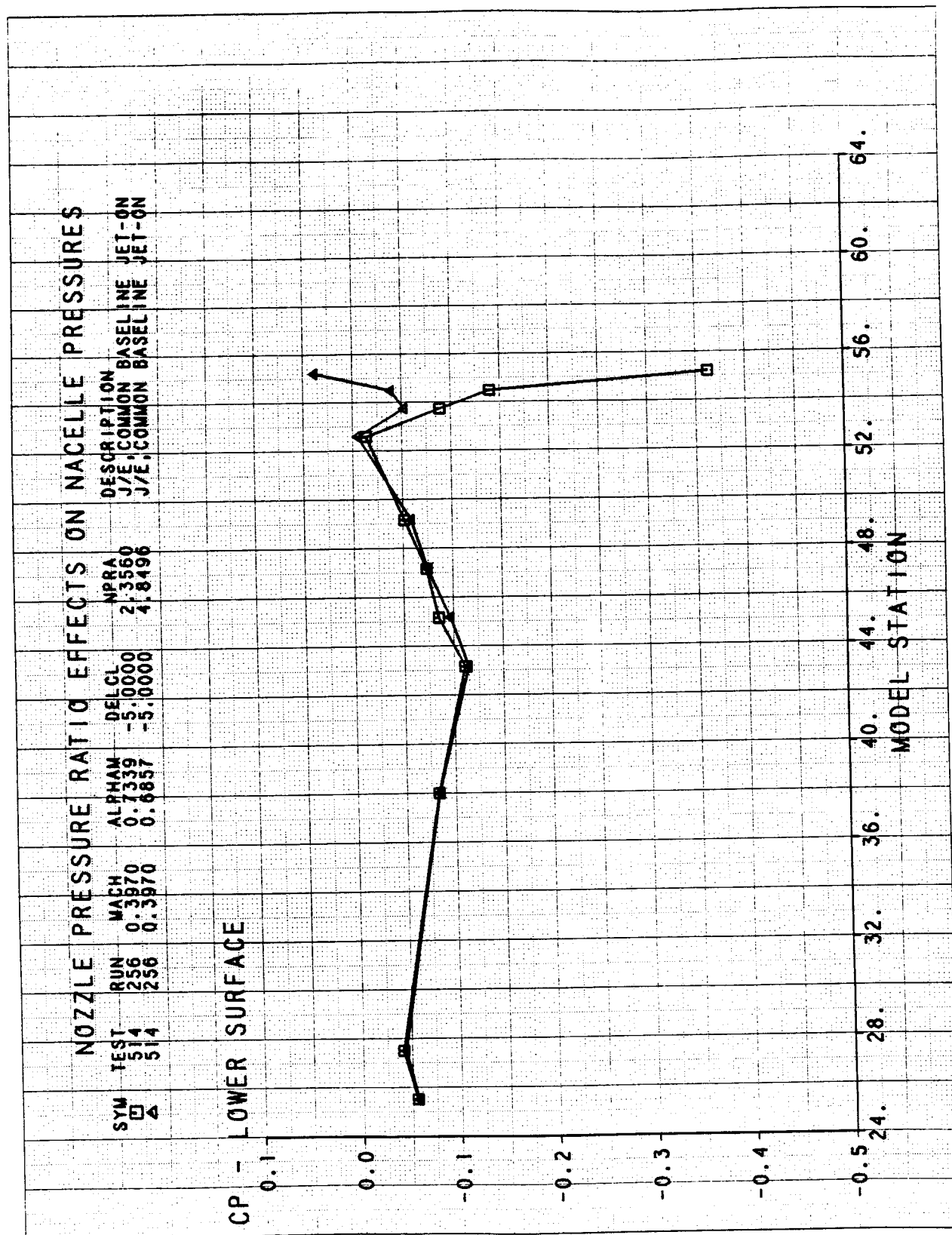


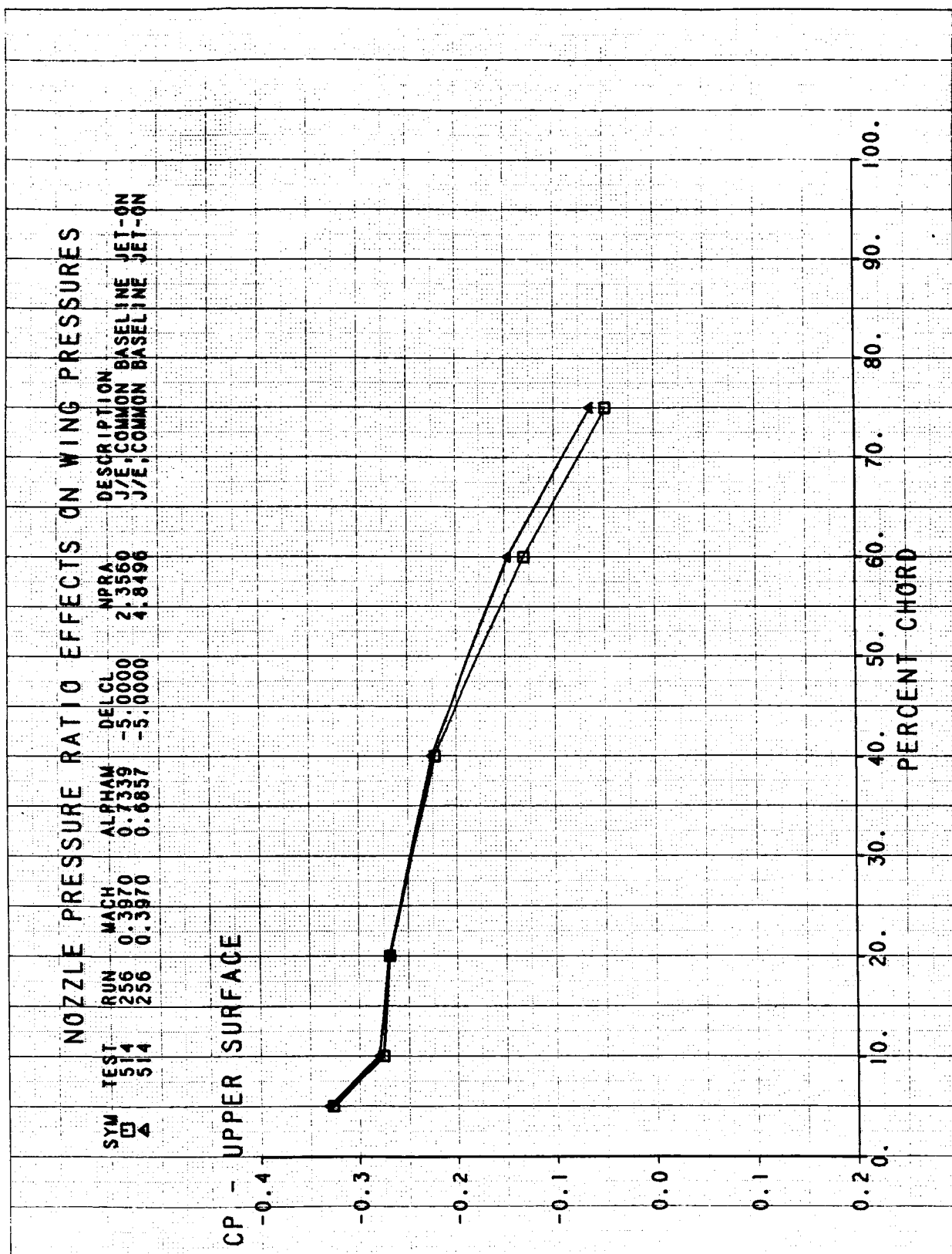


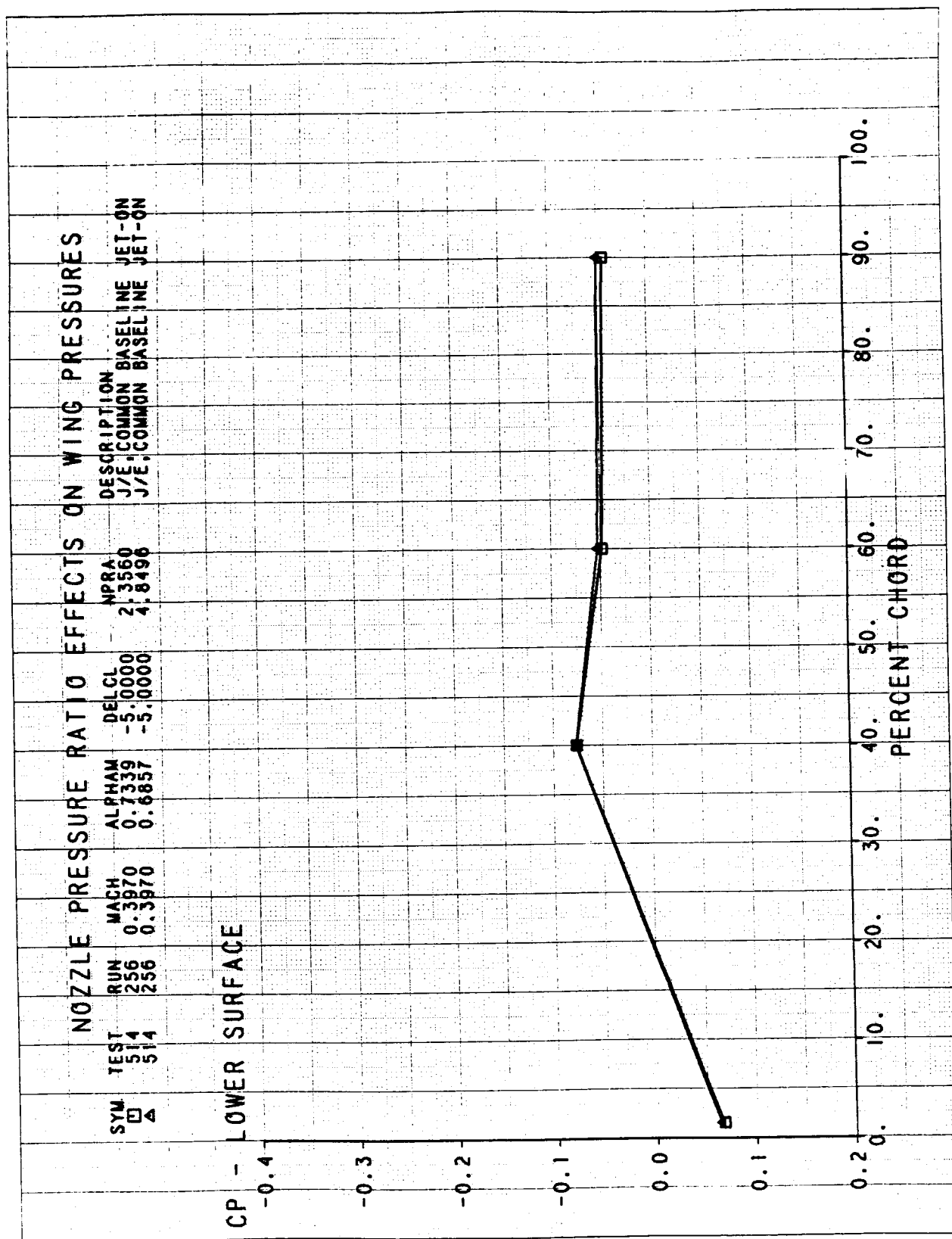








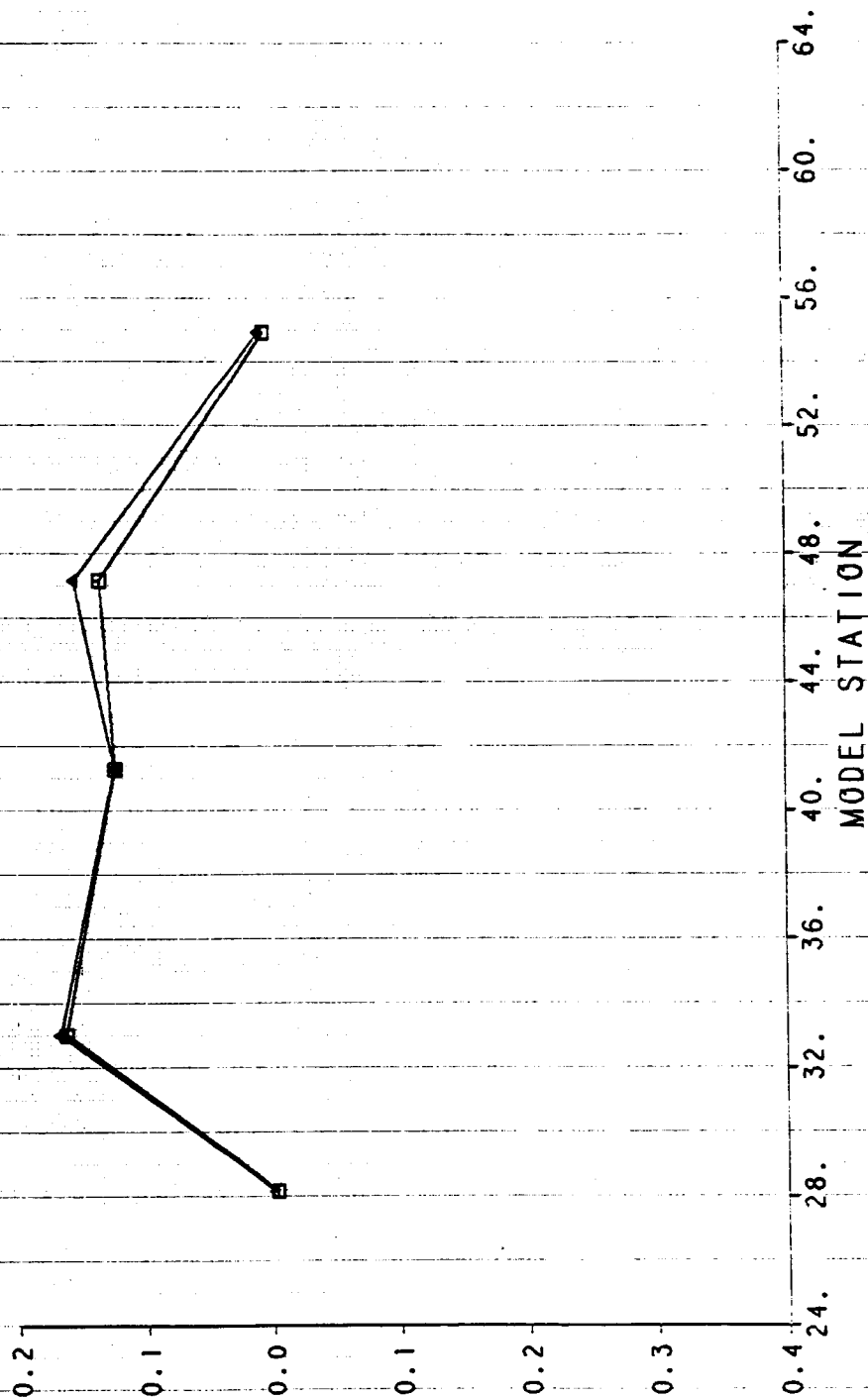




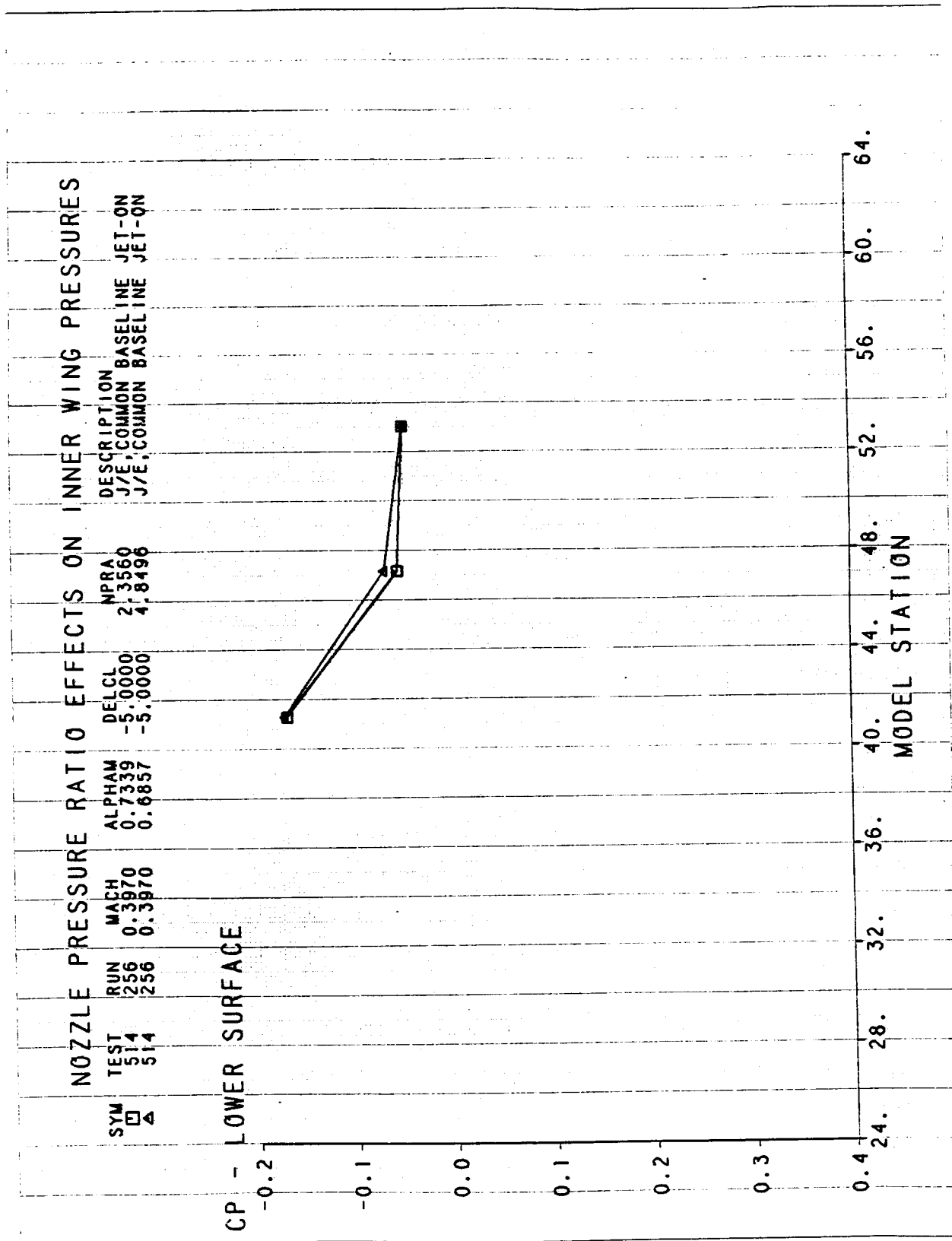
# NOZZLE PRESSURE RATIO EFFECTS ON INNER WING PRESSURES

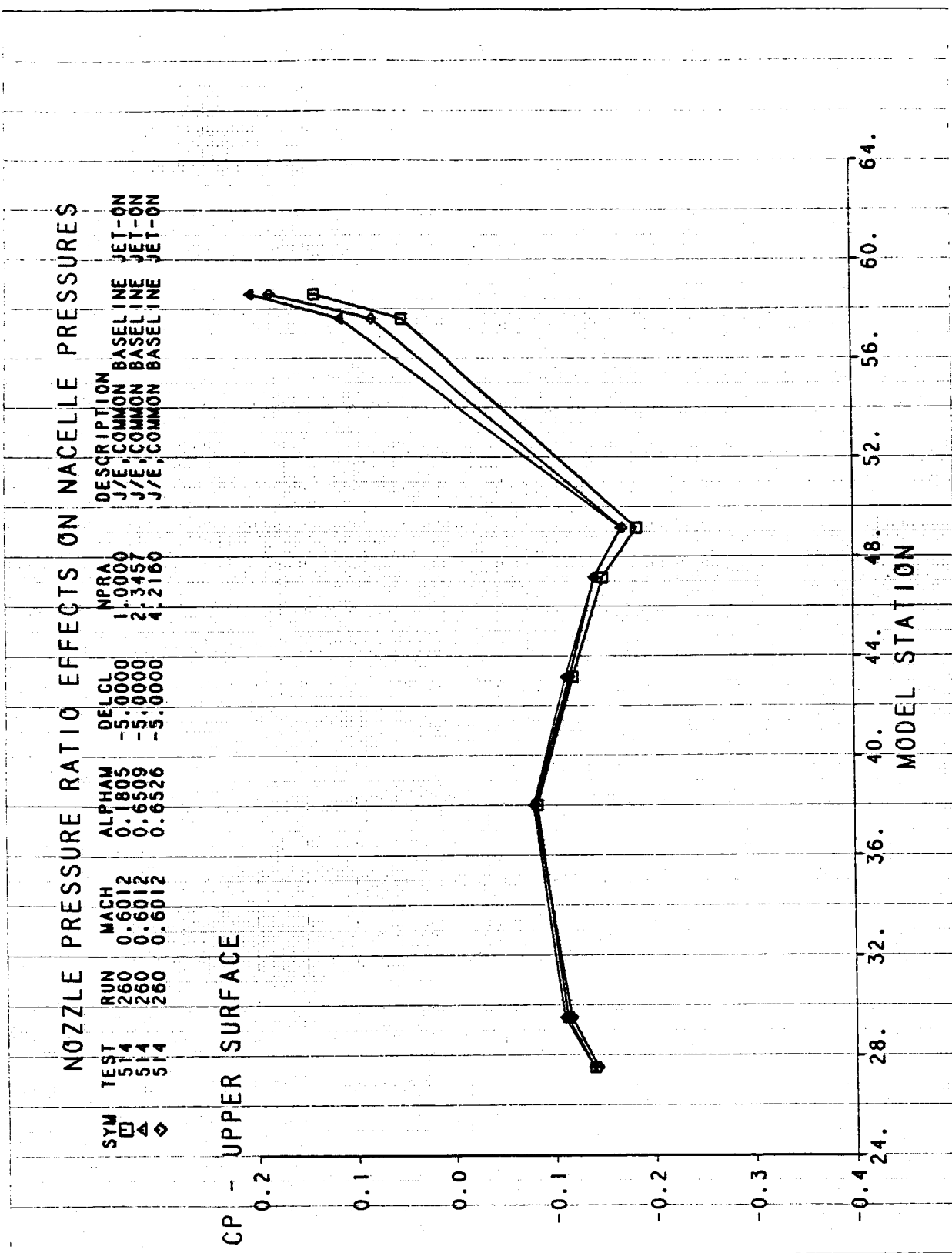
SYM	TEST	RUN	MACH	ALPHAM	DELCL	NPRA	DESCRIPTION
□	514	256	0.3970	0.7339	-5.0000	2.3560	J/E, COMMON BASELINE JET-ON
△	514	256	0.3970	0.6857	-5.0000	4.8496	J/E, COMMON BASELINE JET-ON

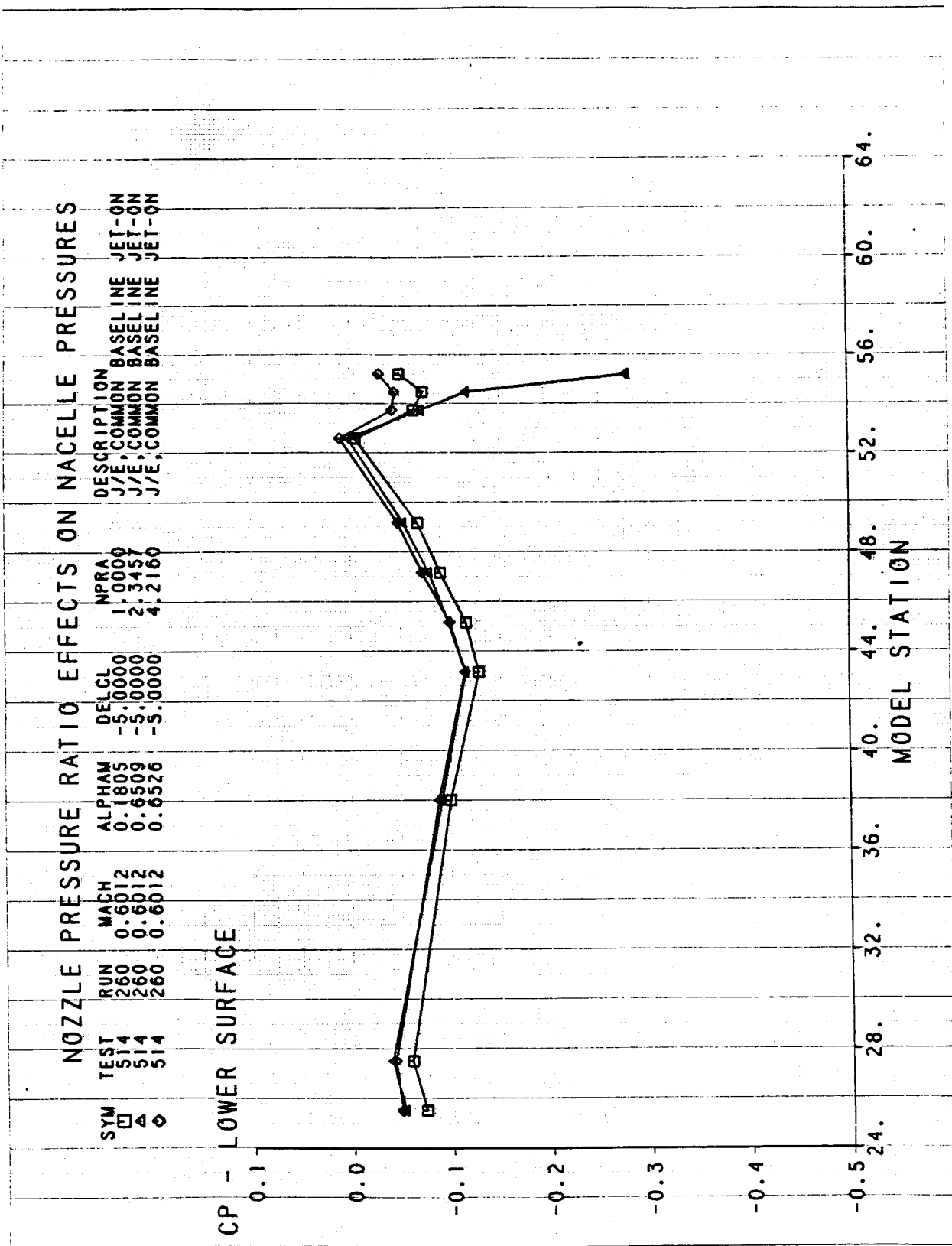
CP - UPPER SURFACE

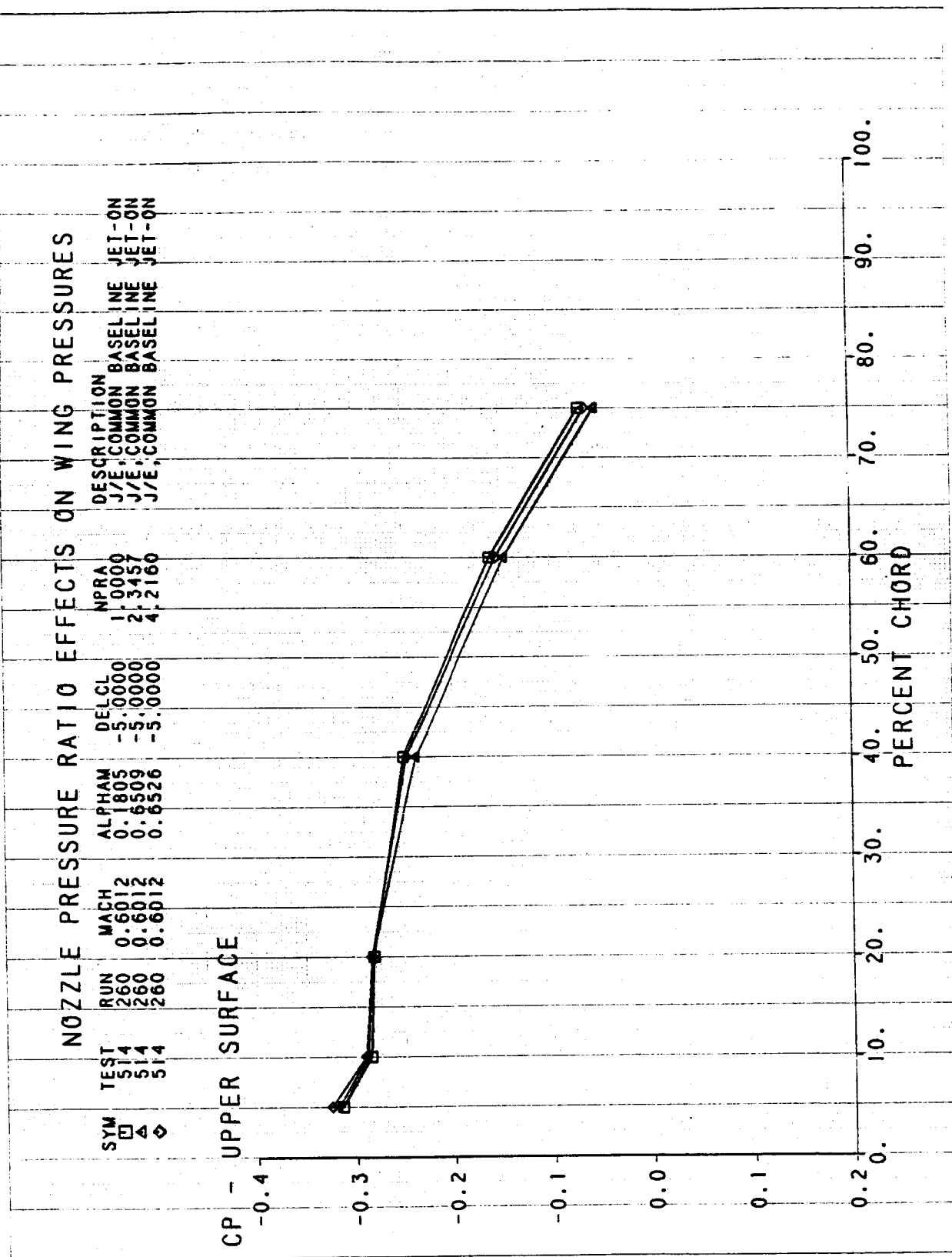


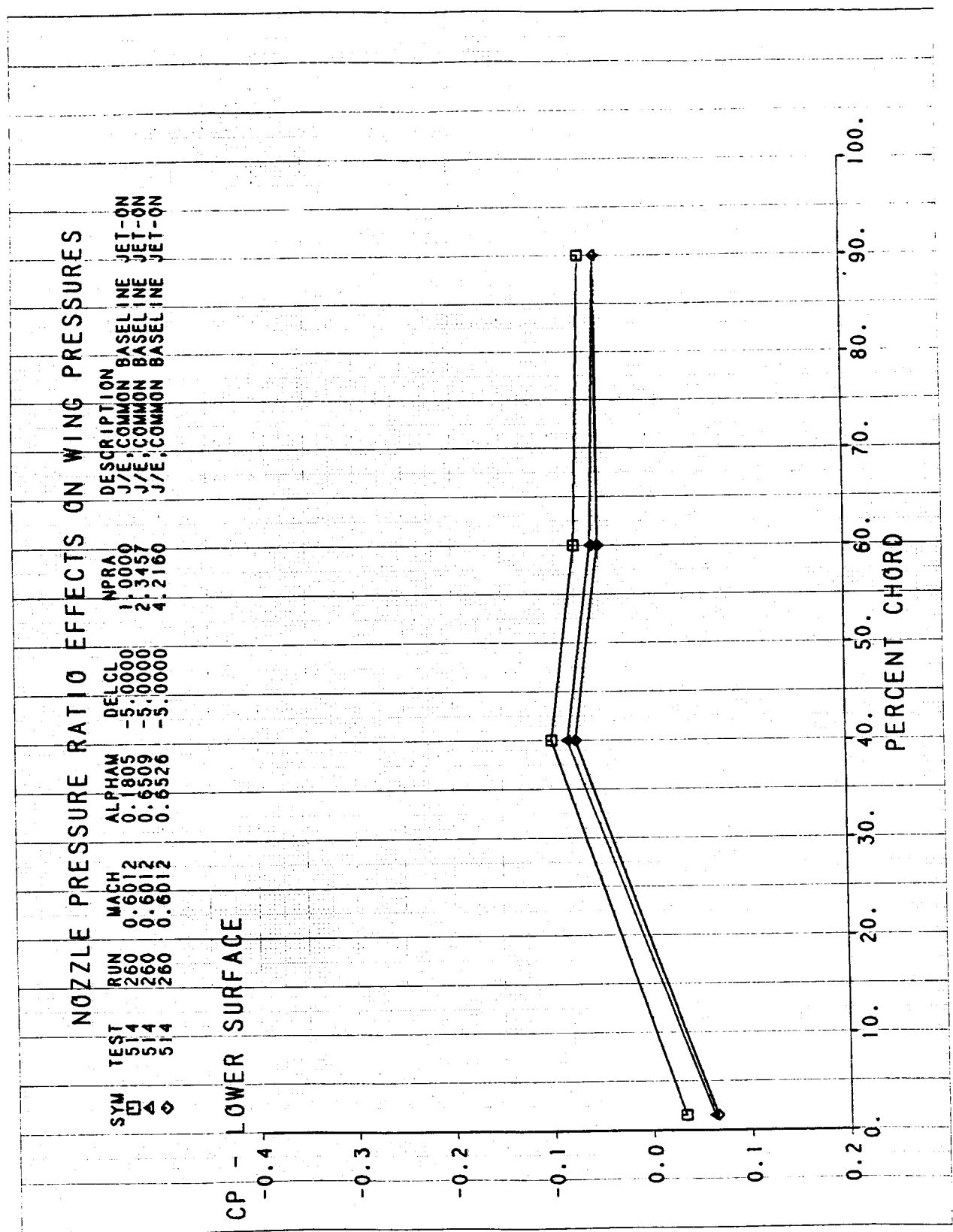


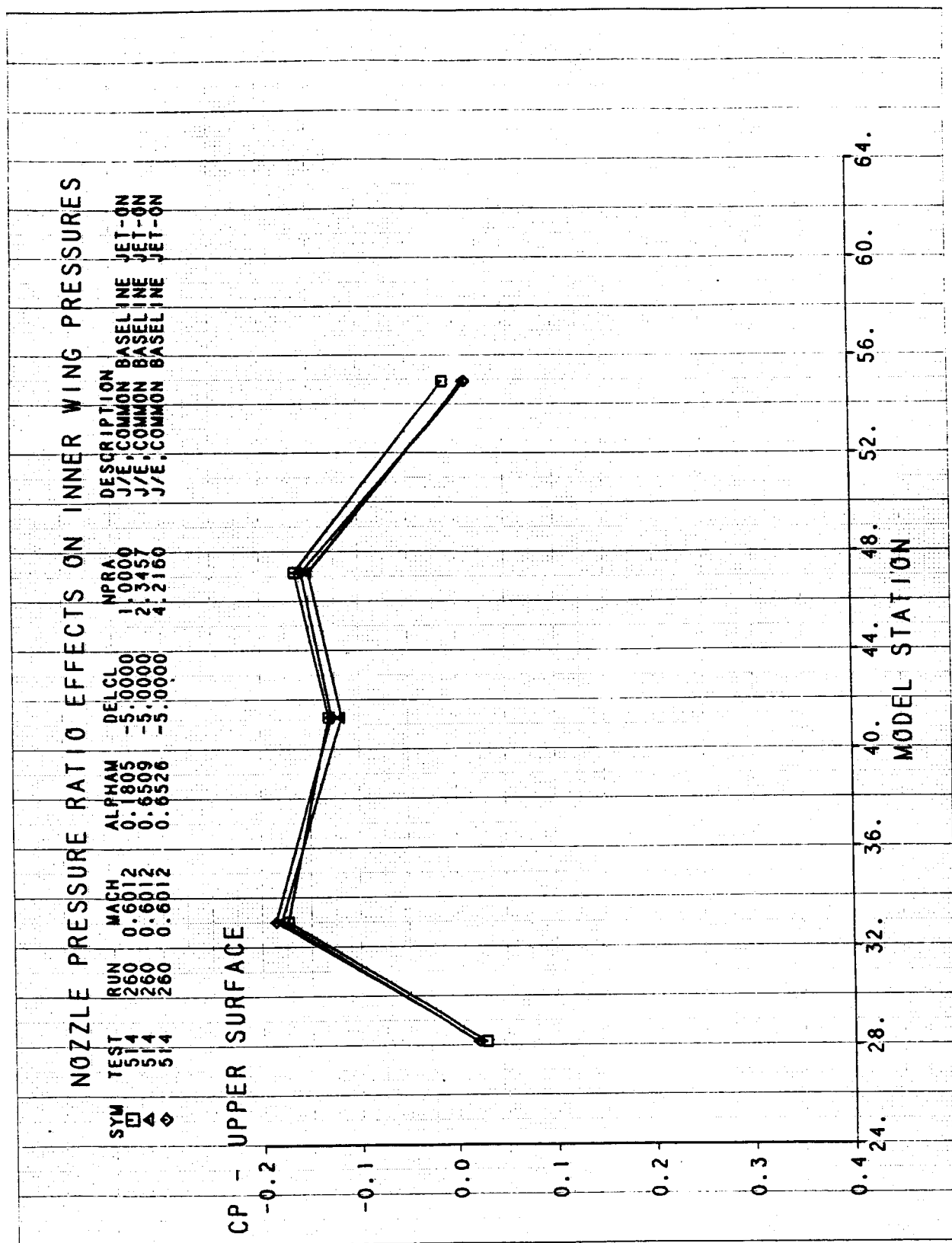


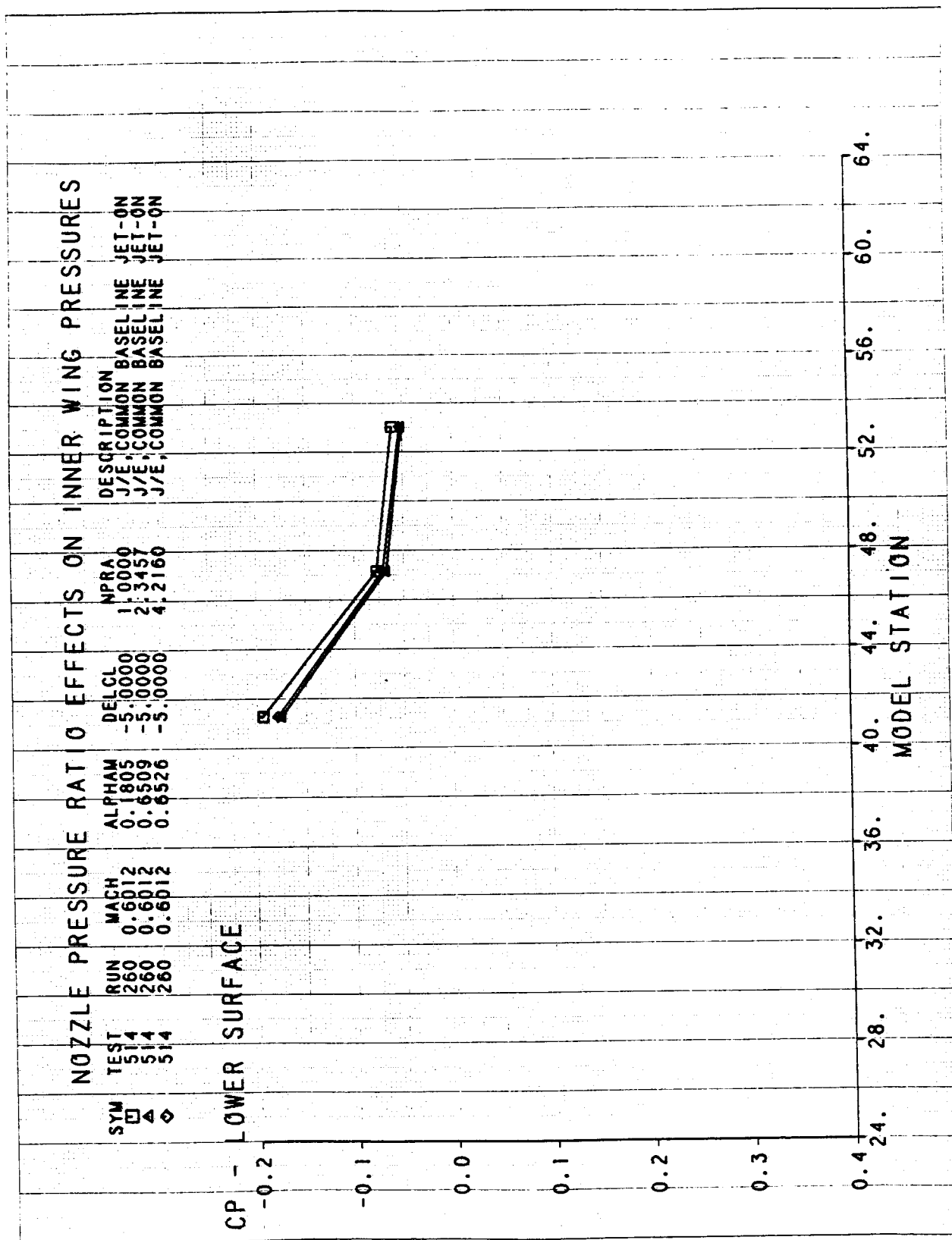


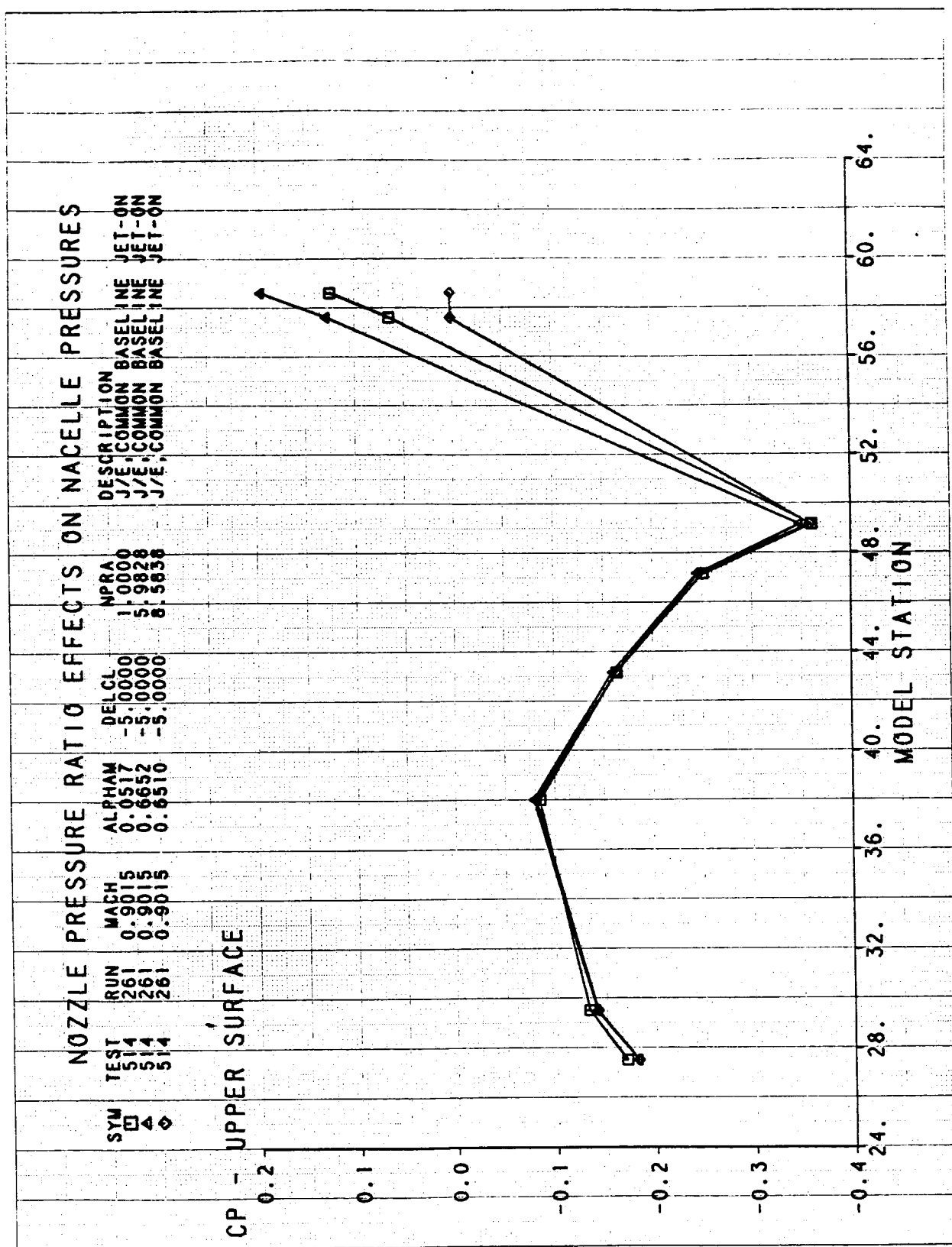




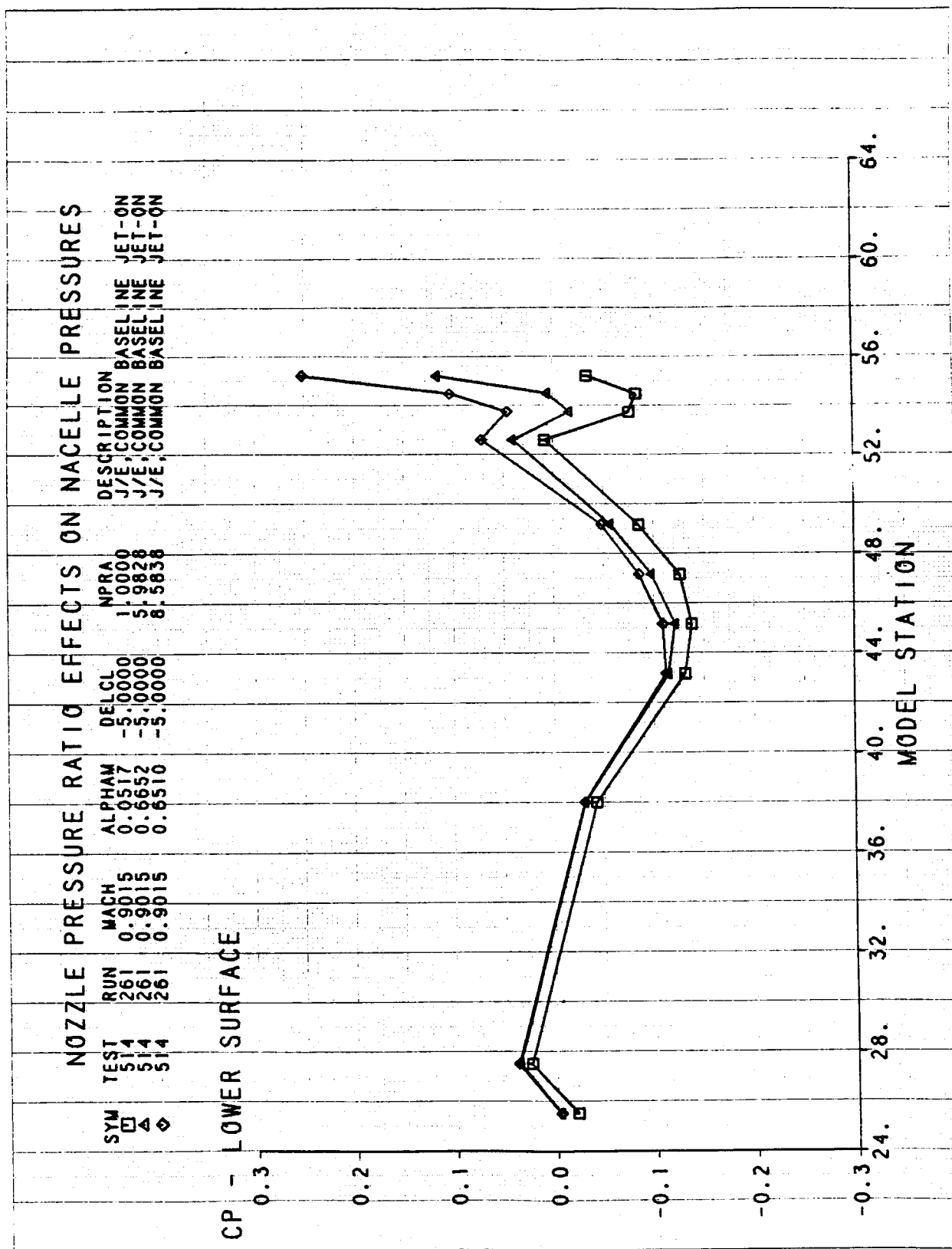


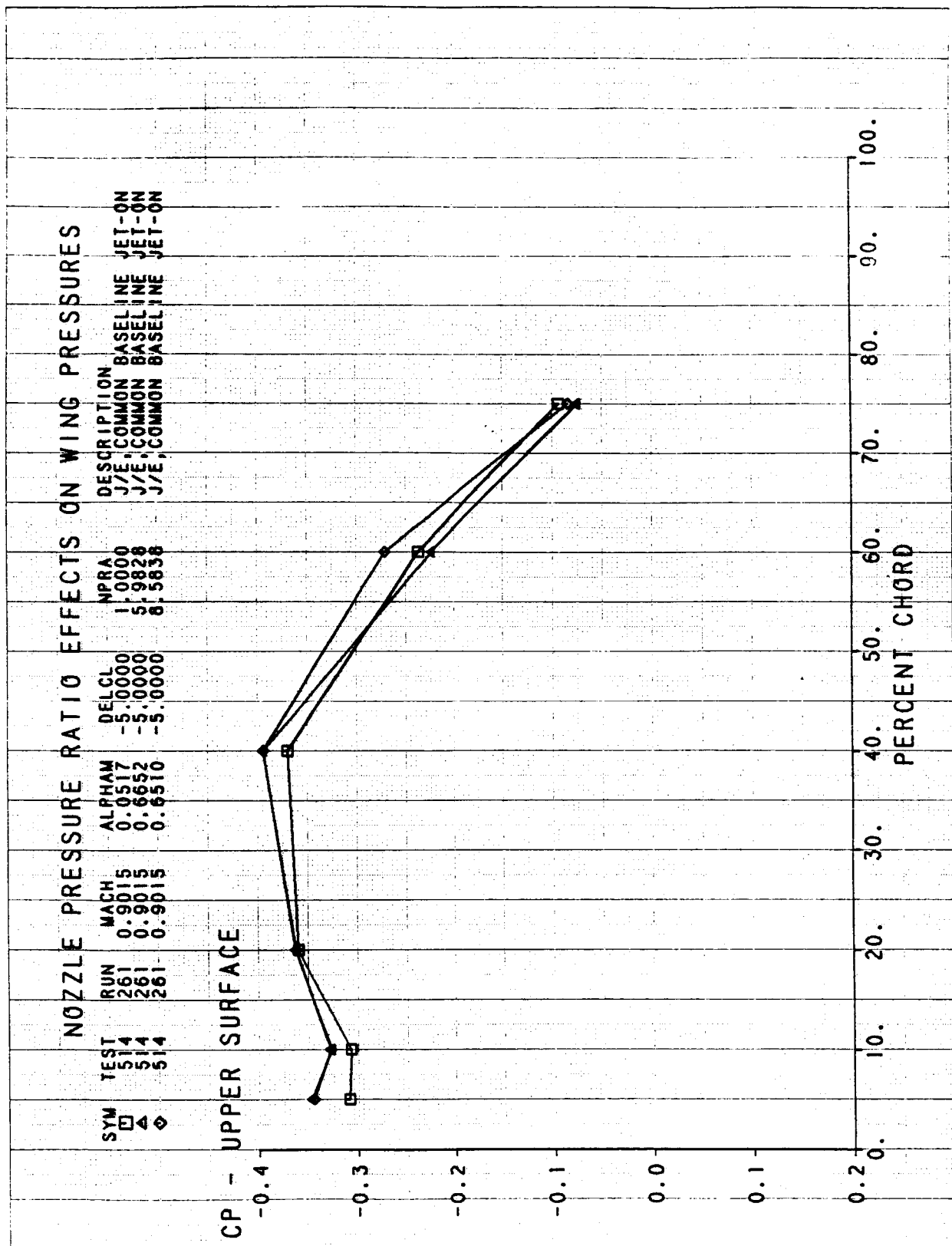


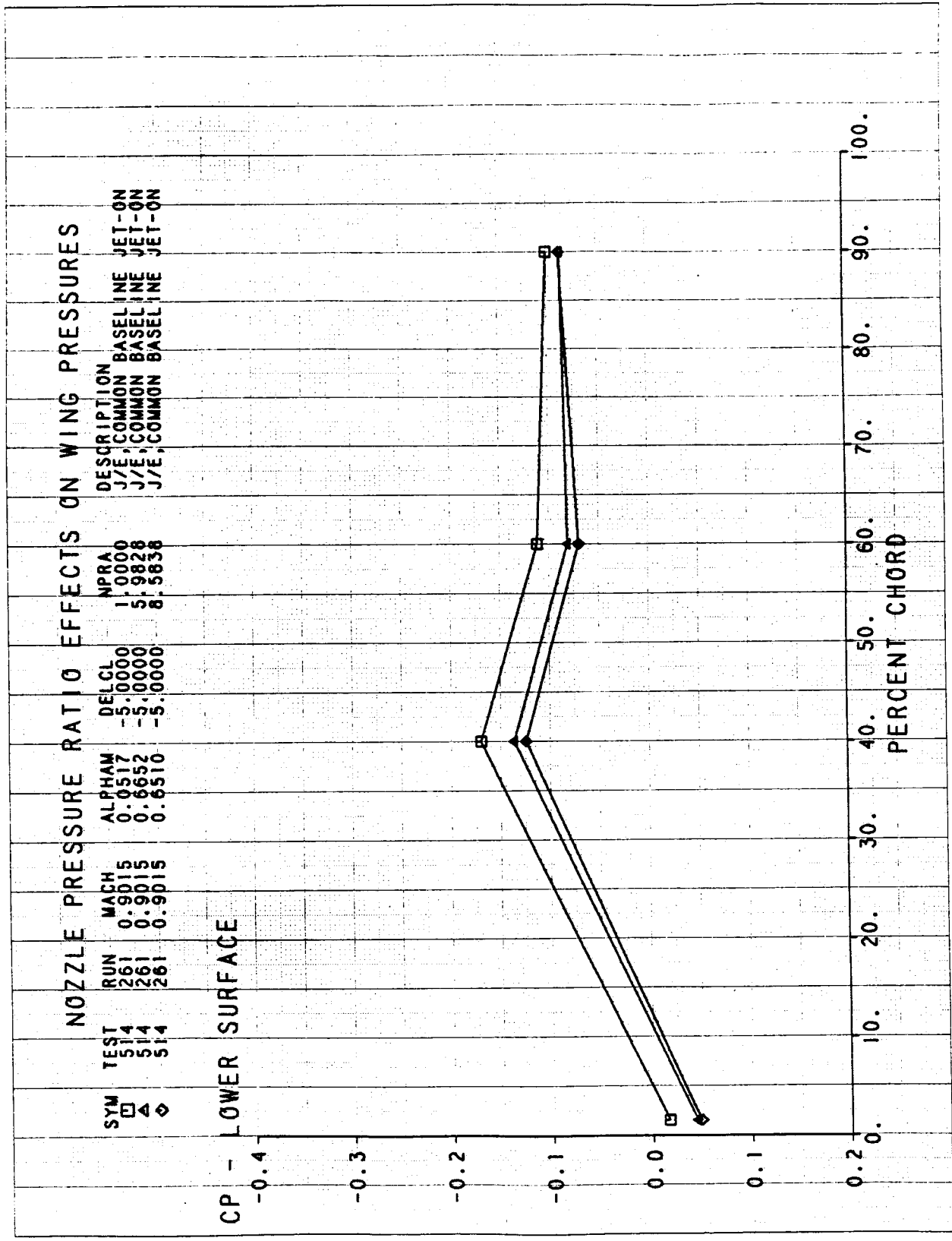


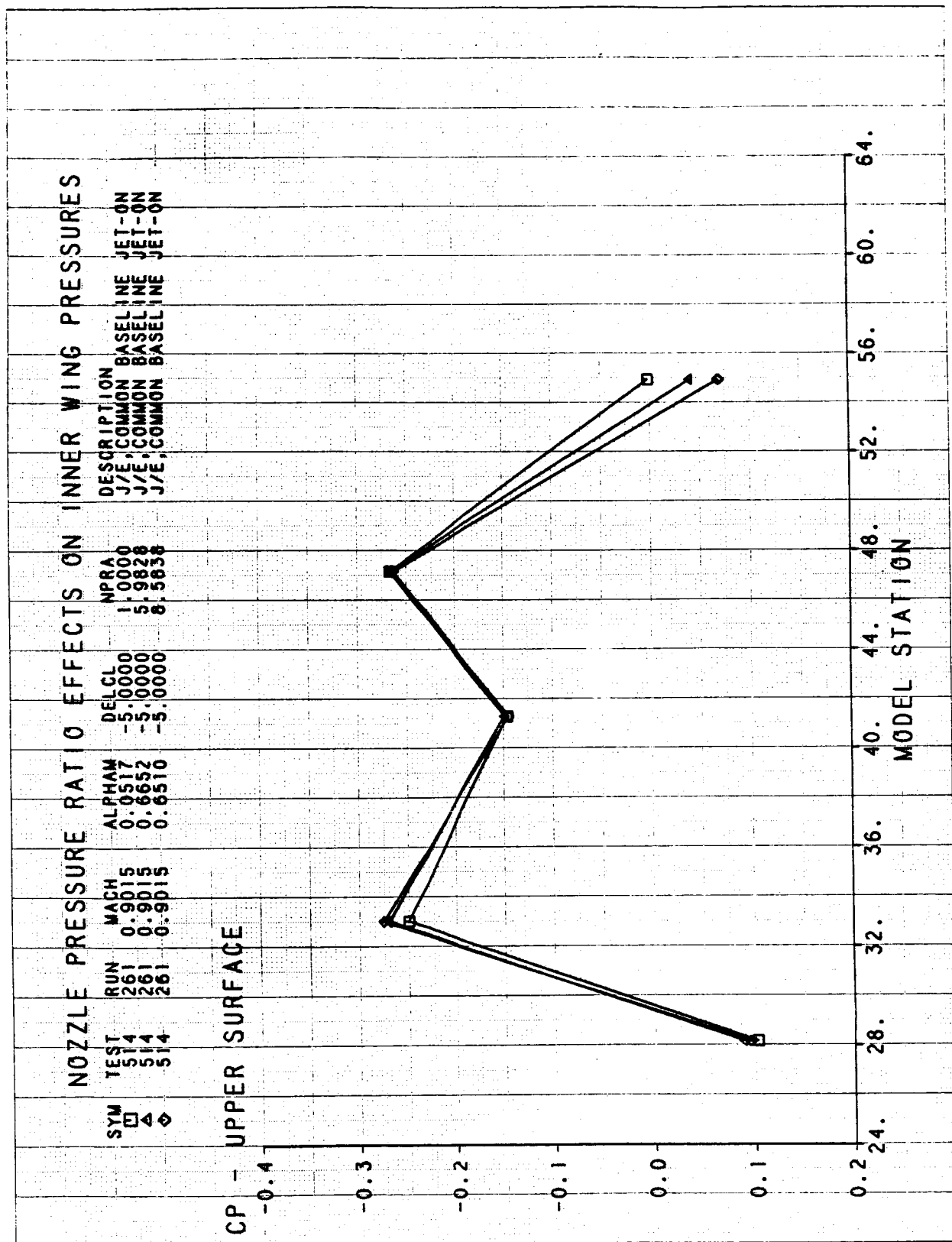


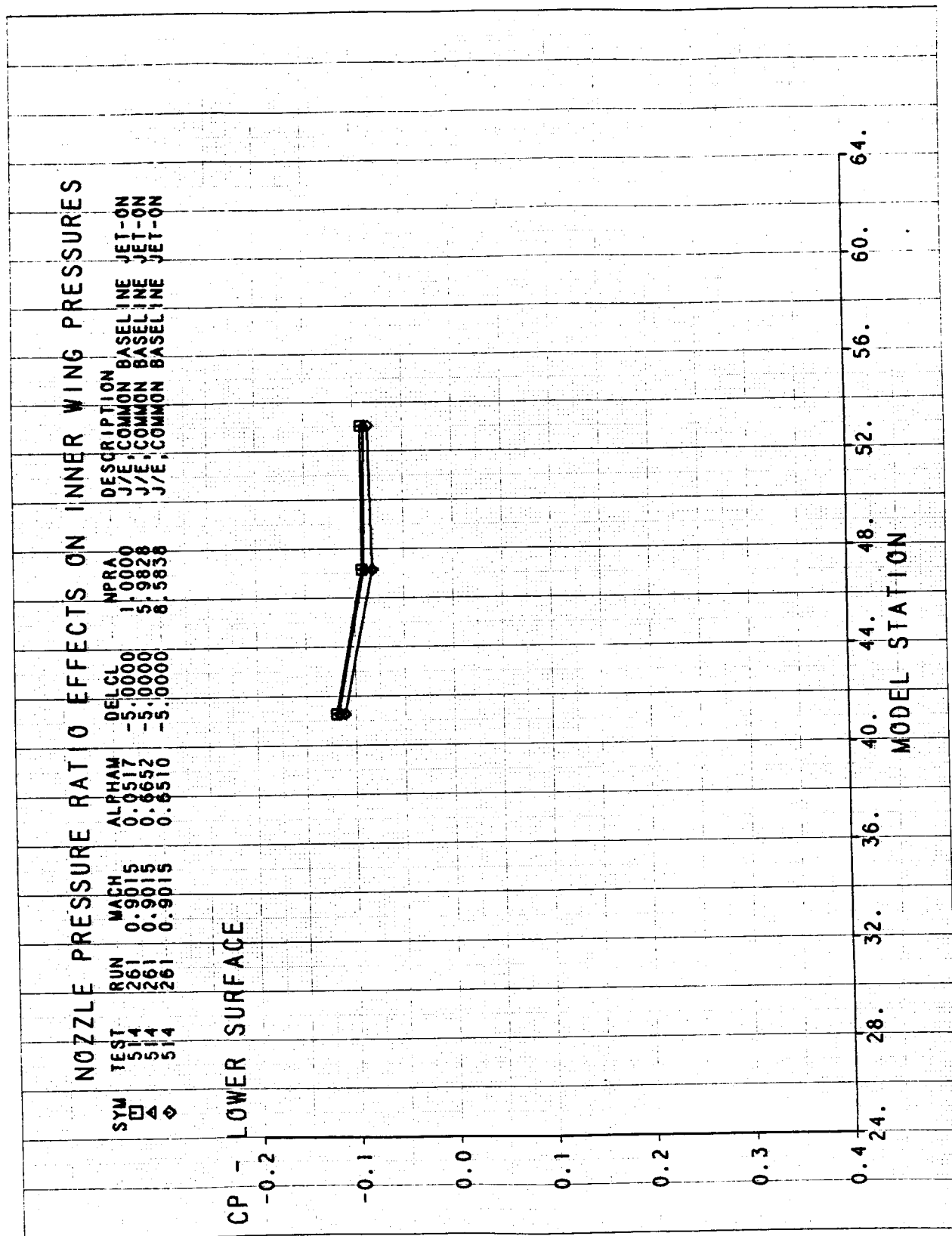


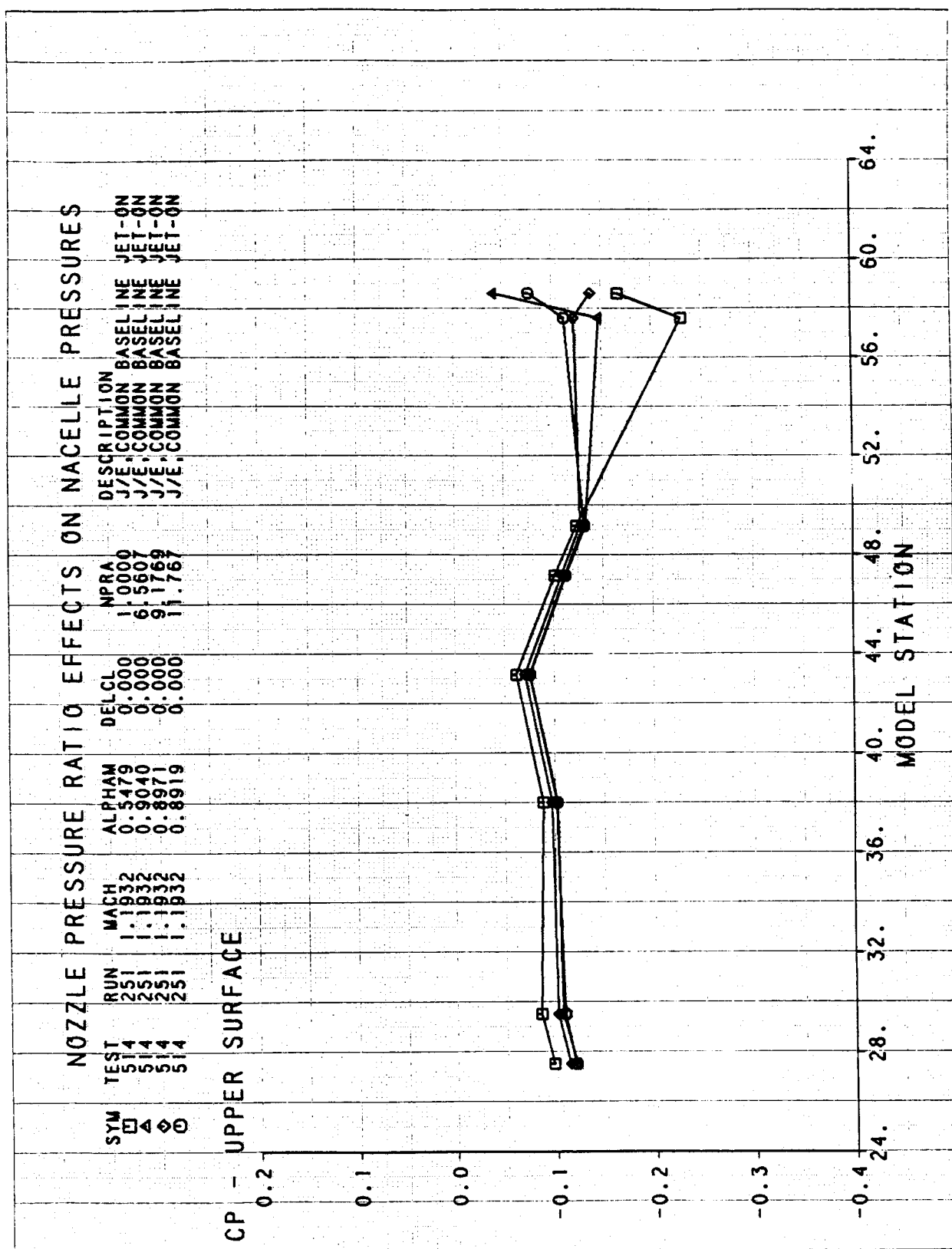


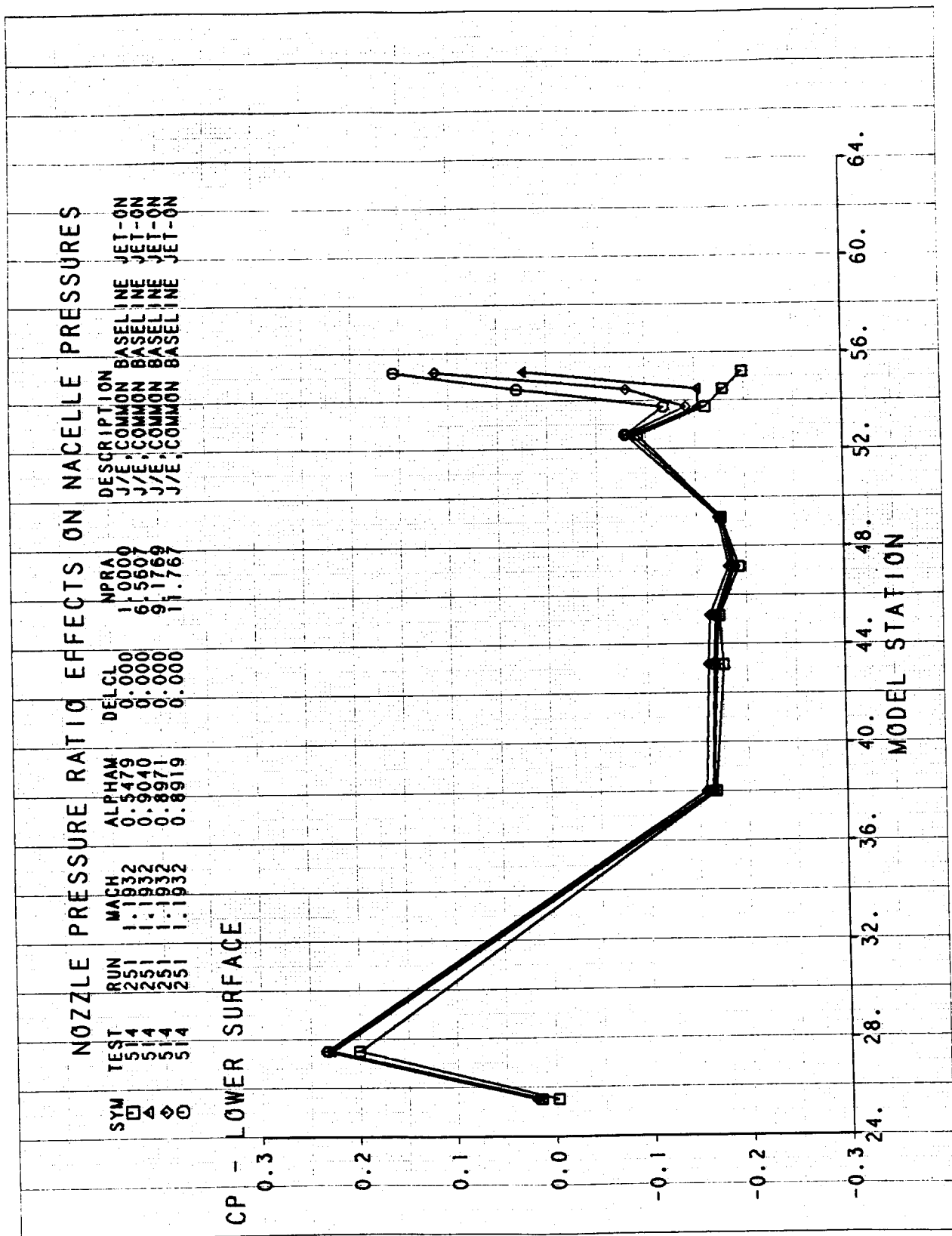


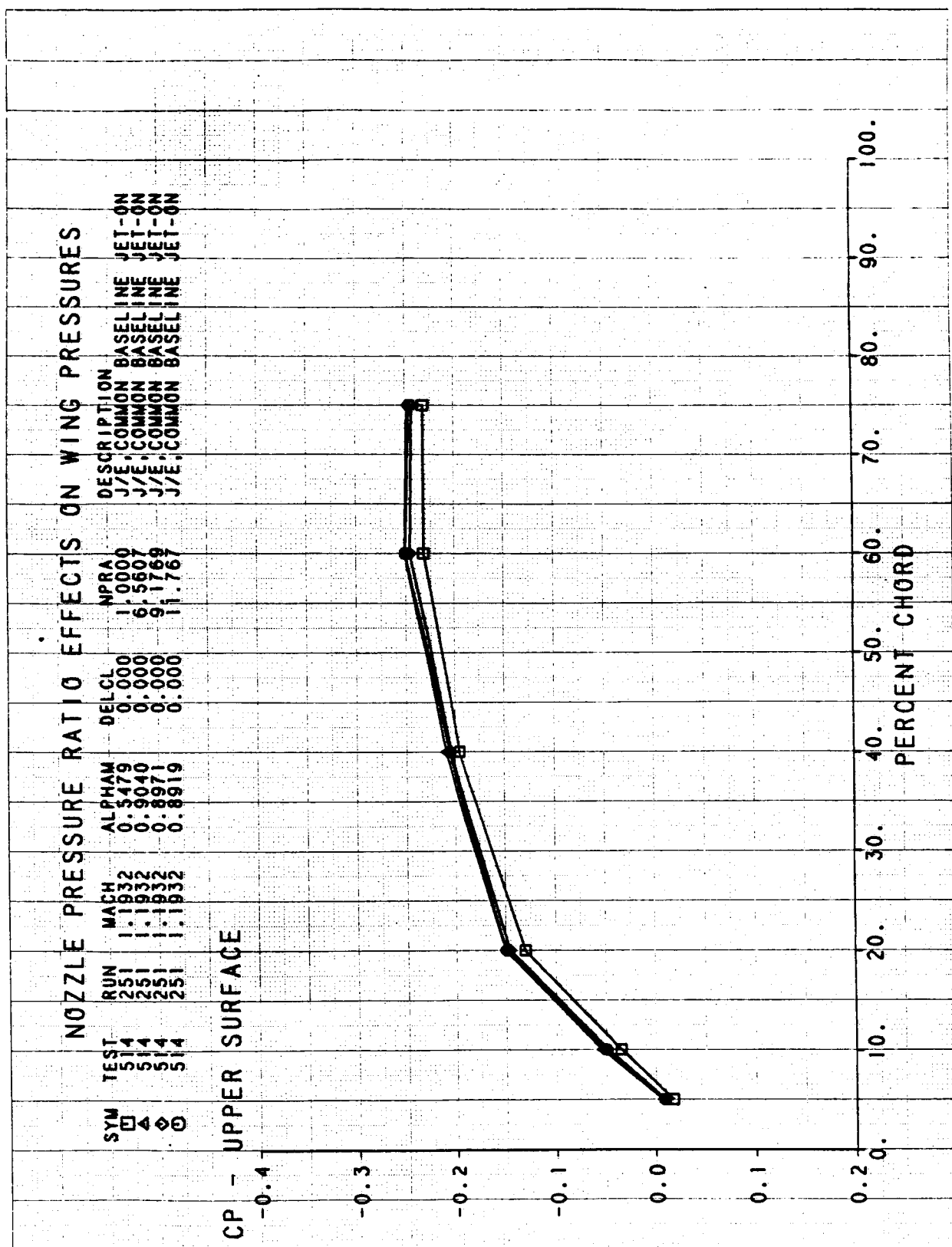




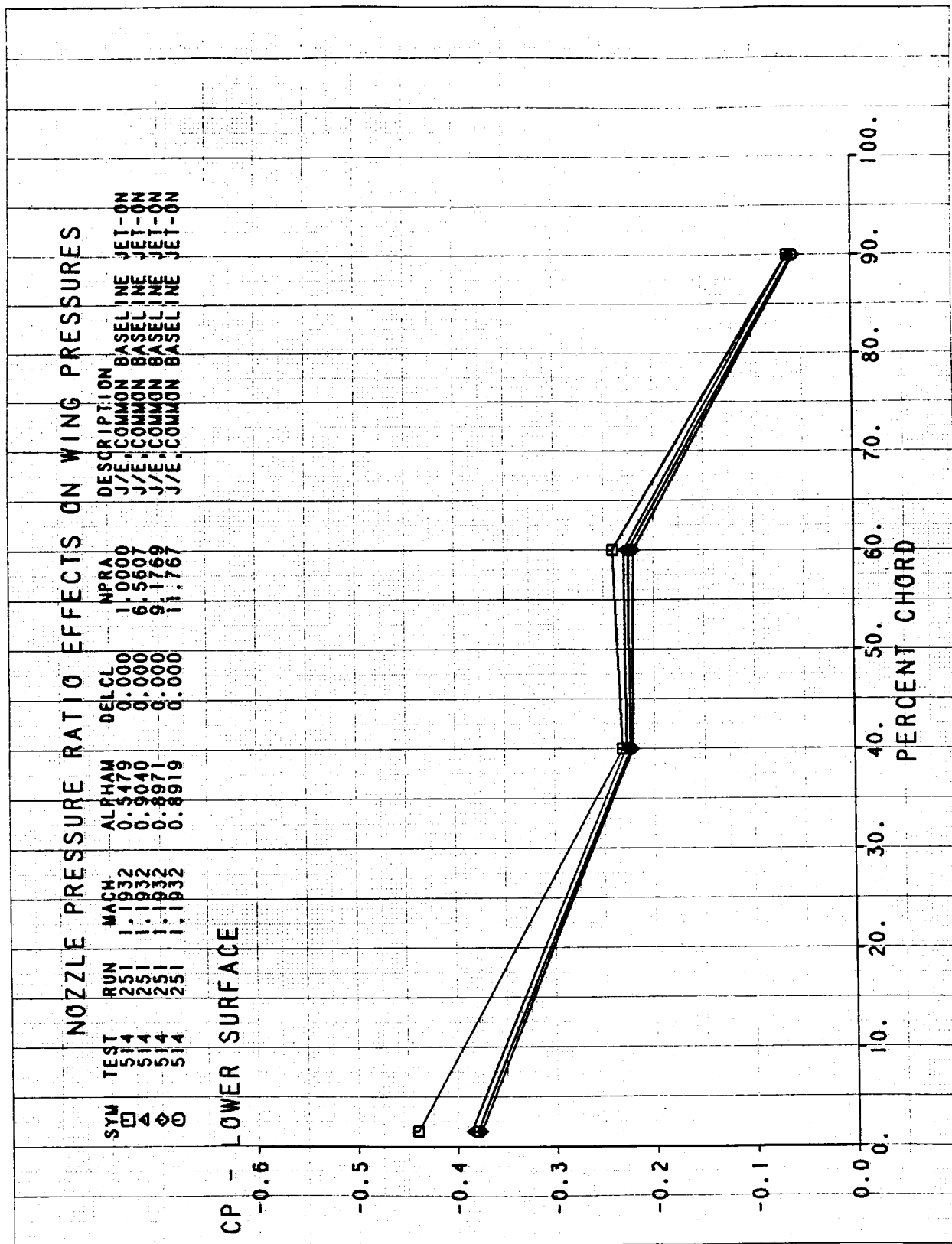


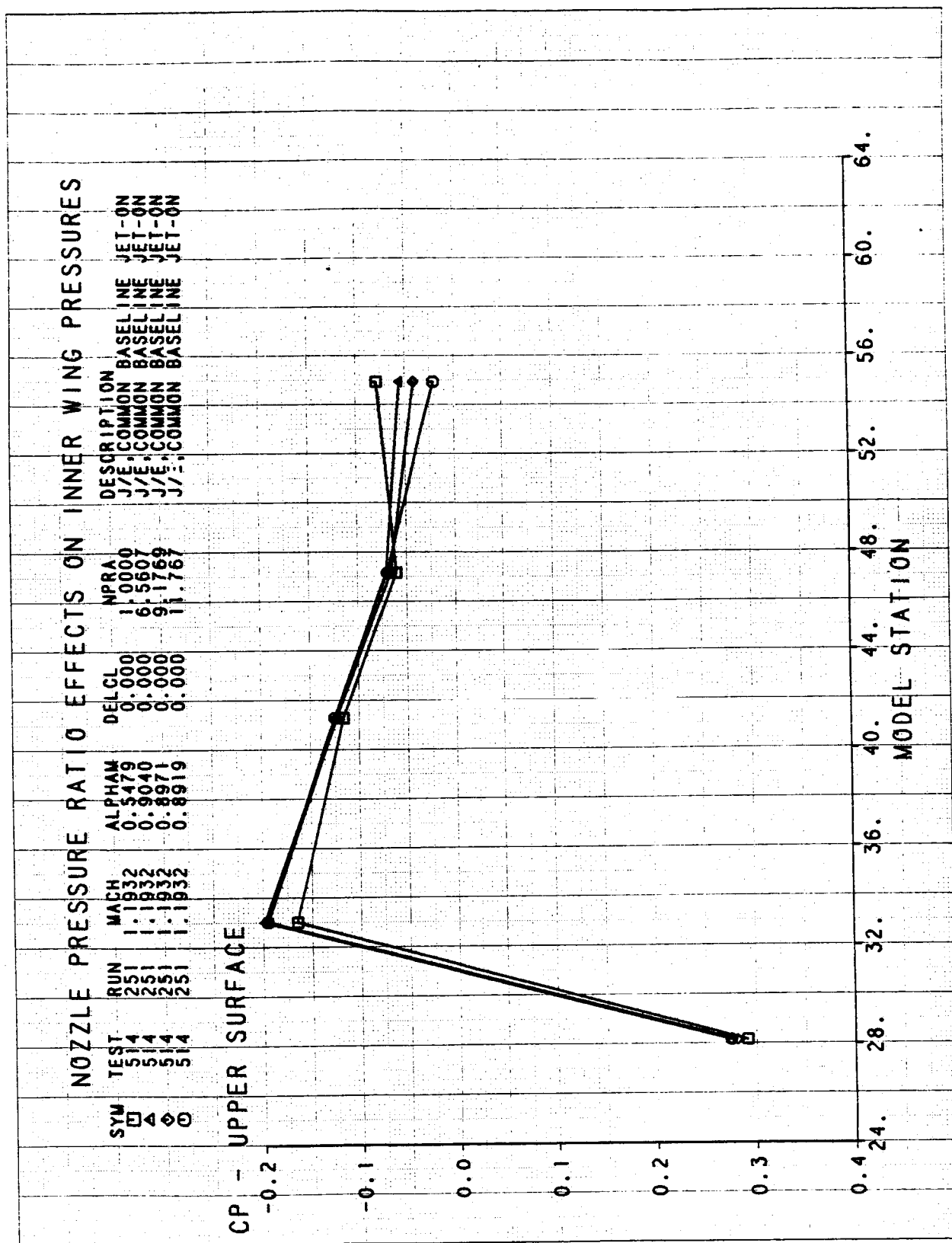


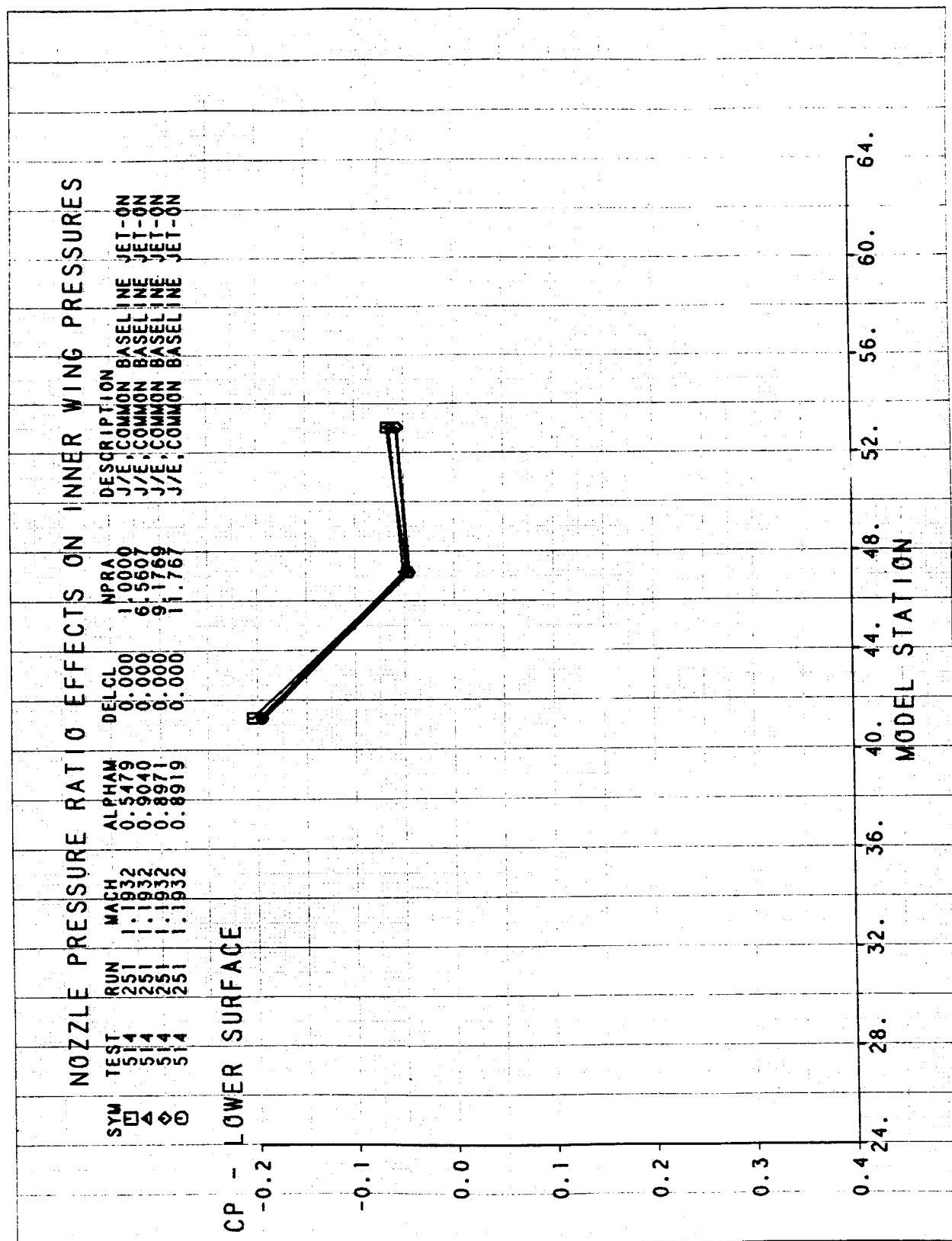


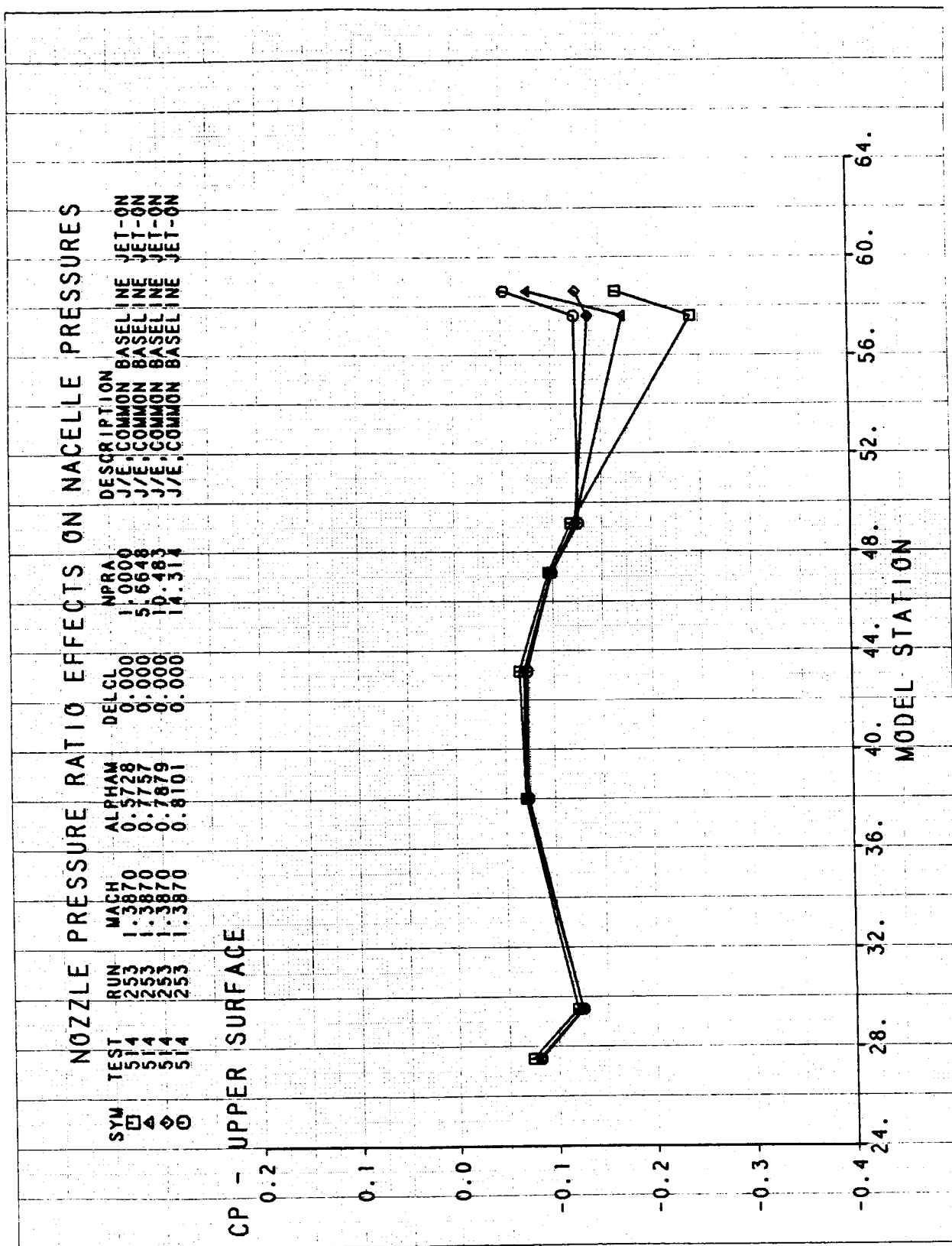


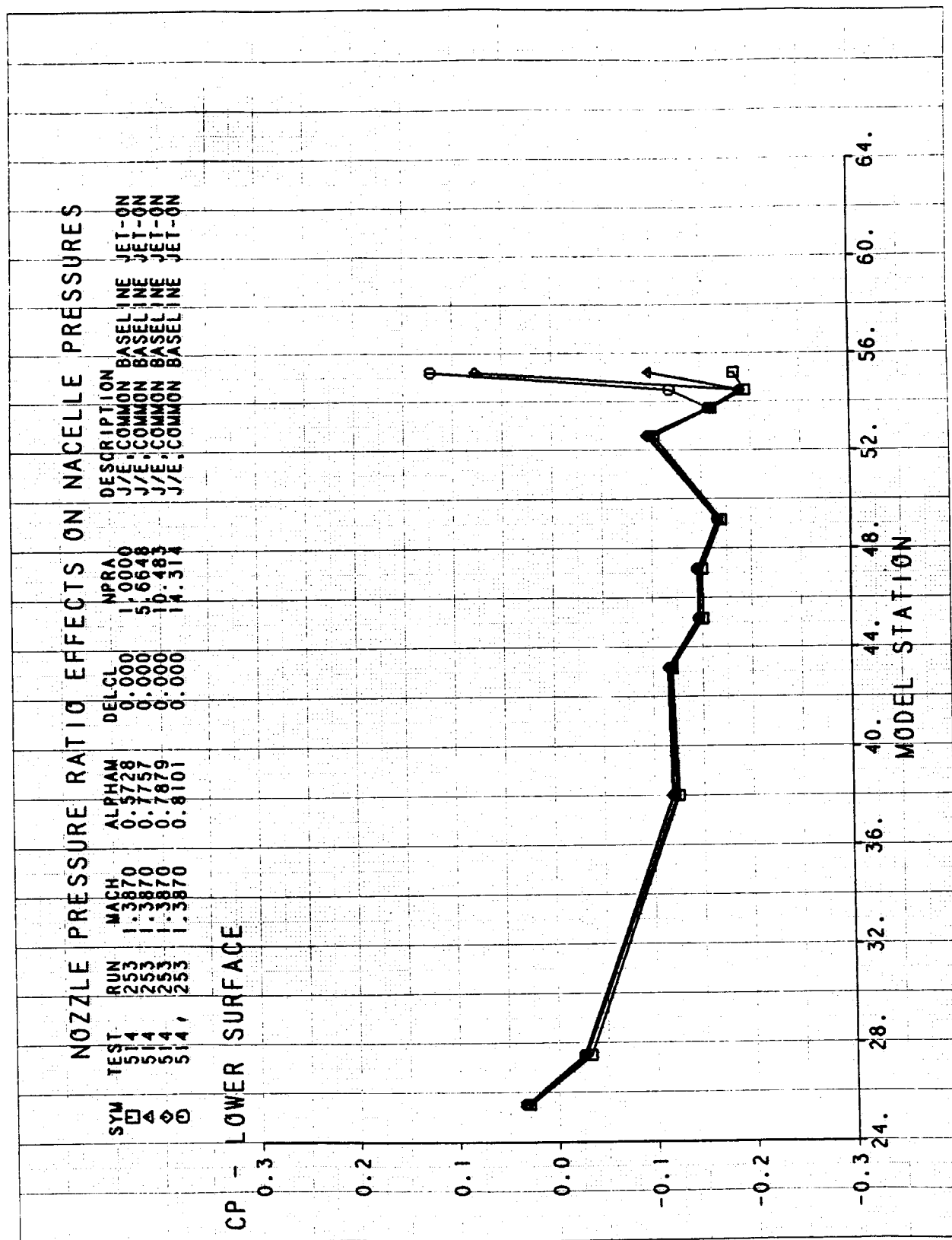


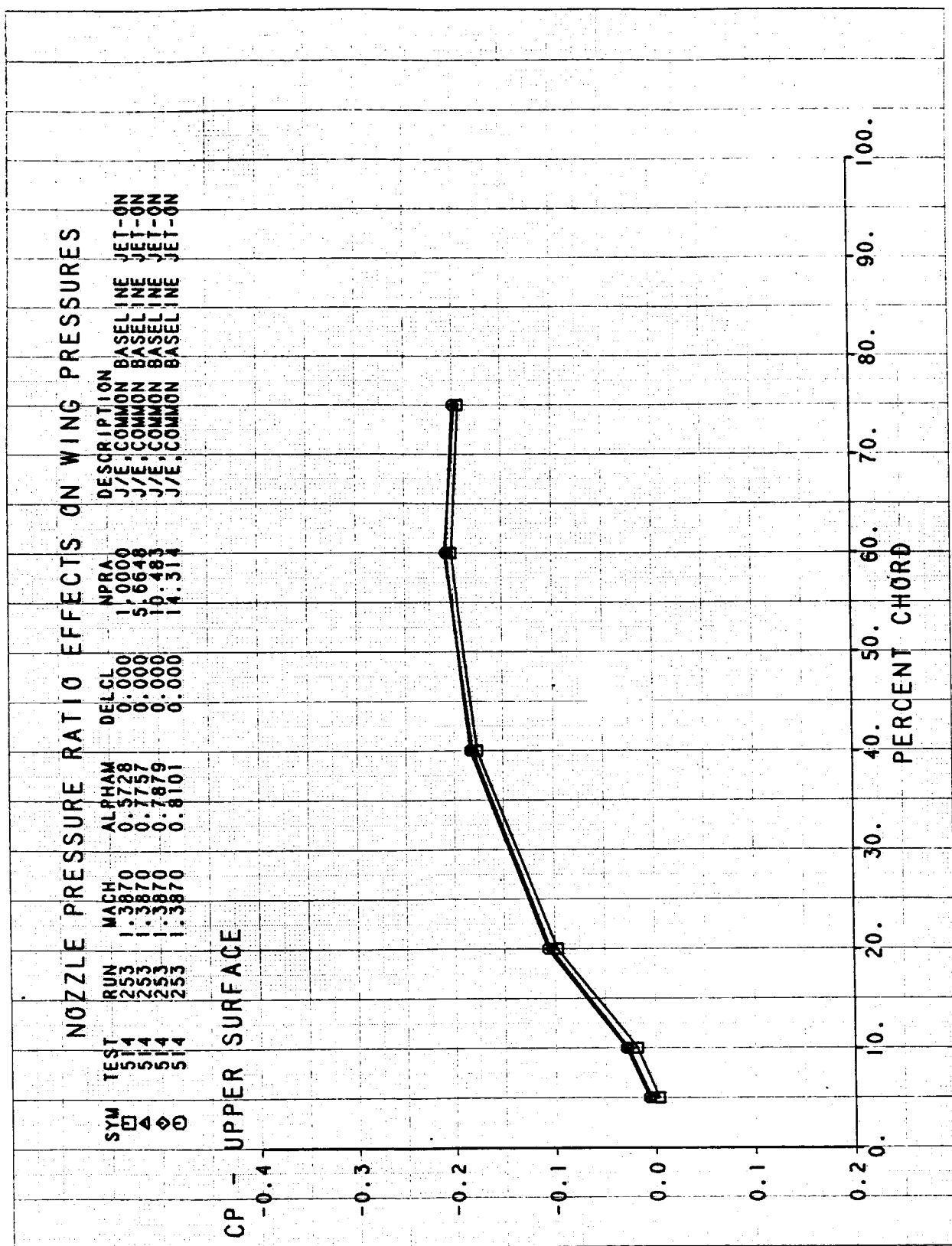


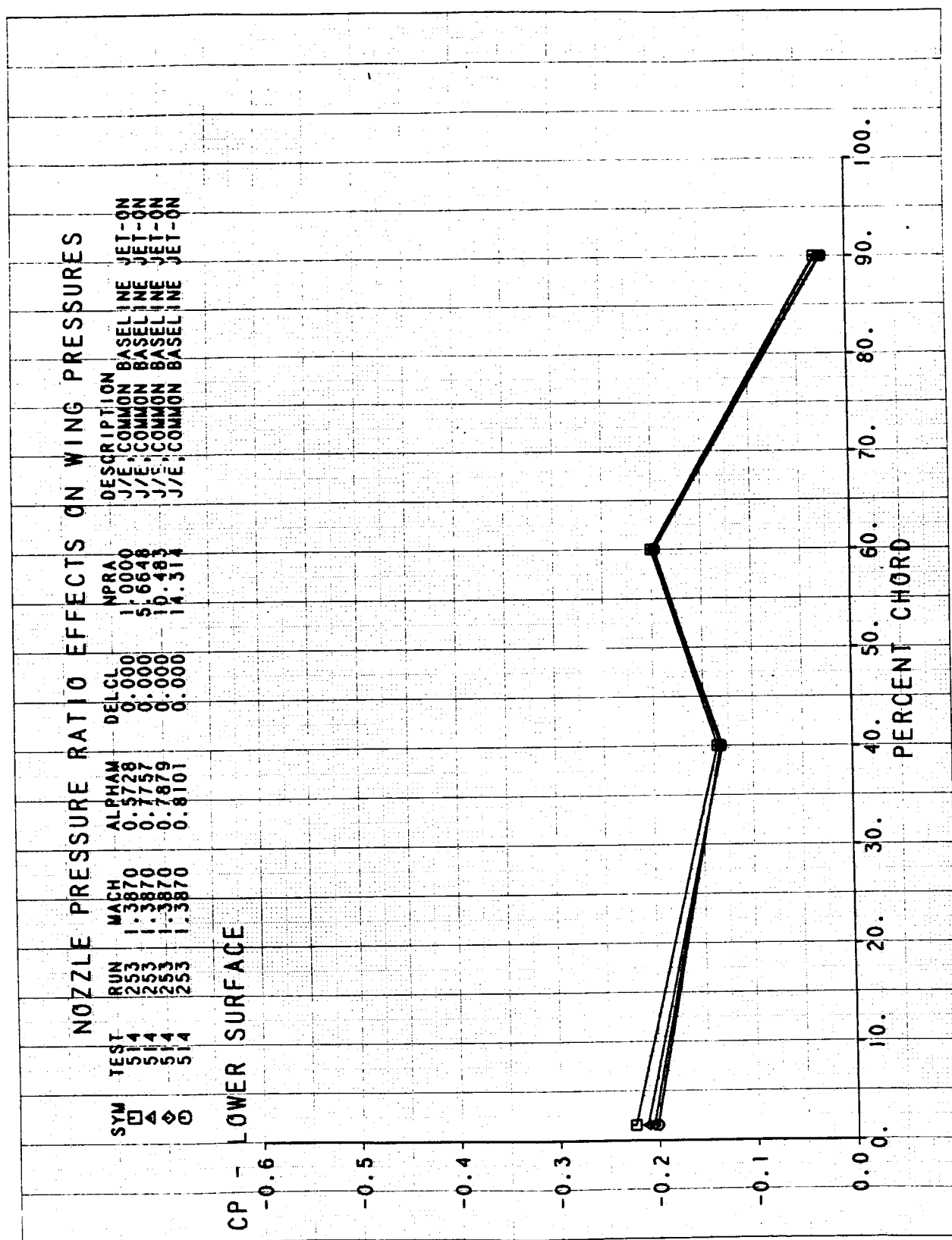


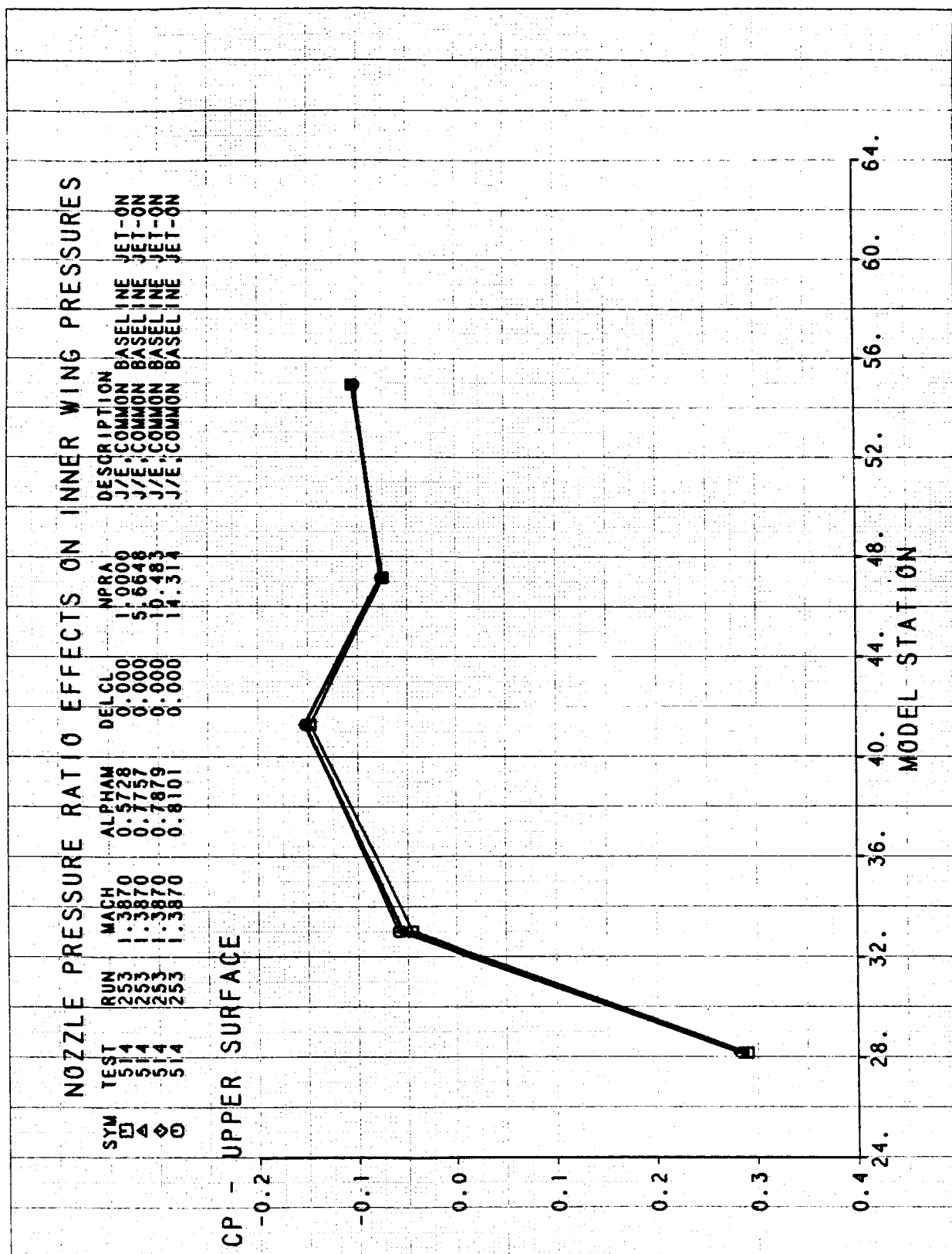




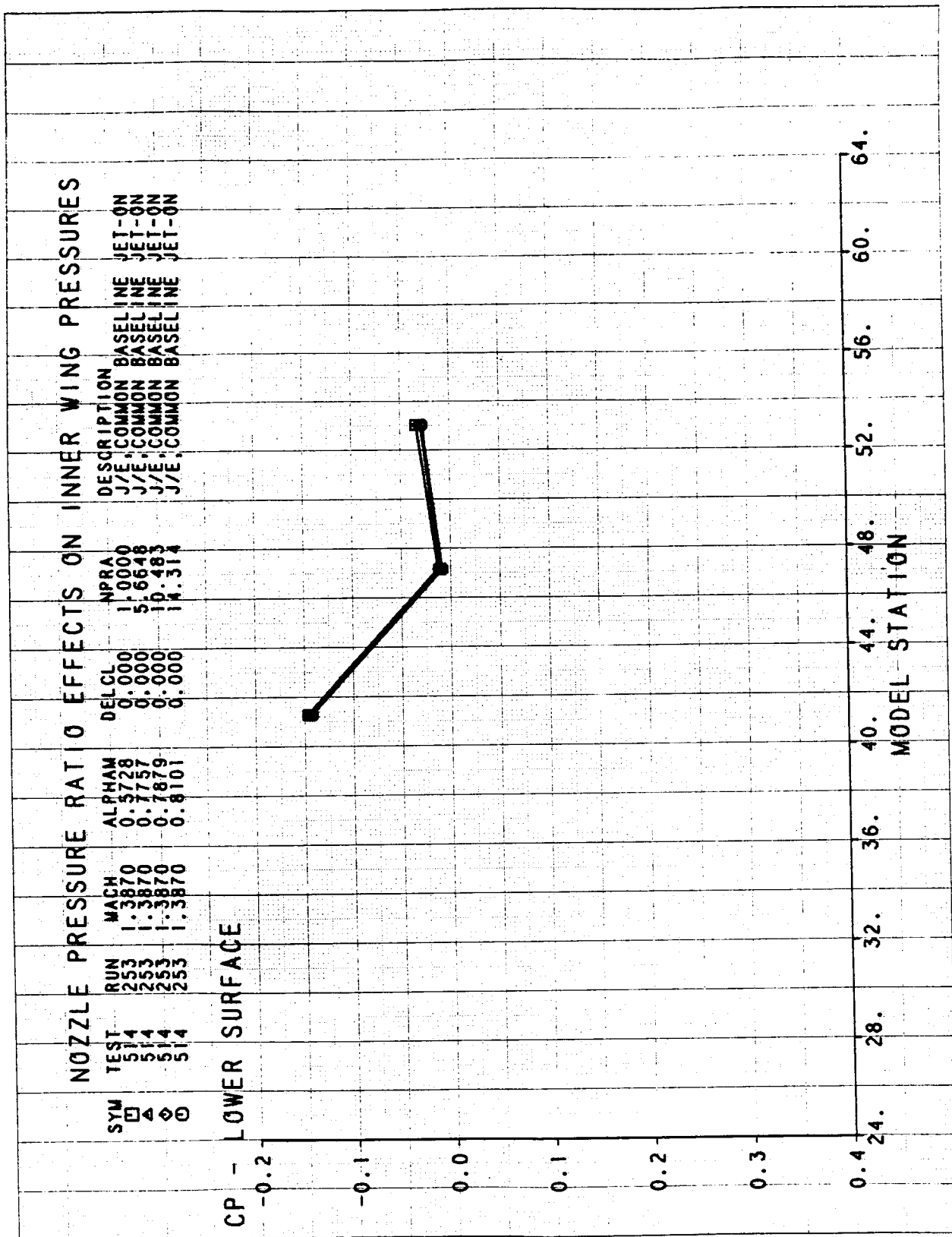


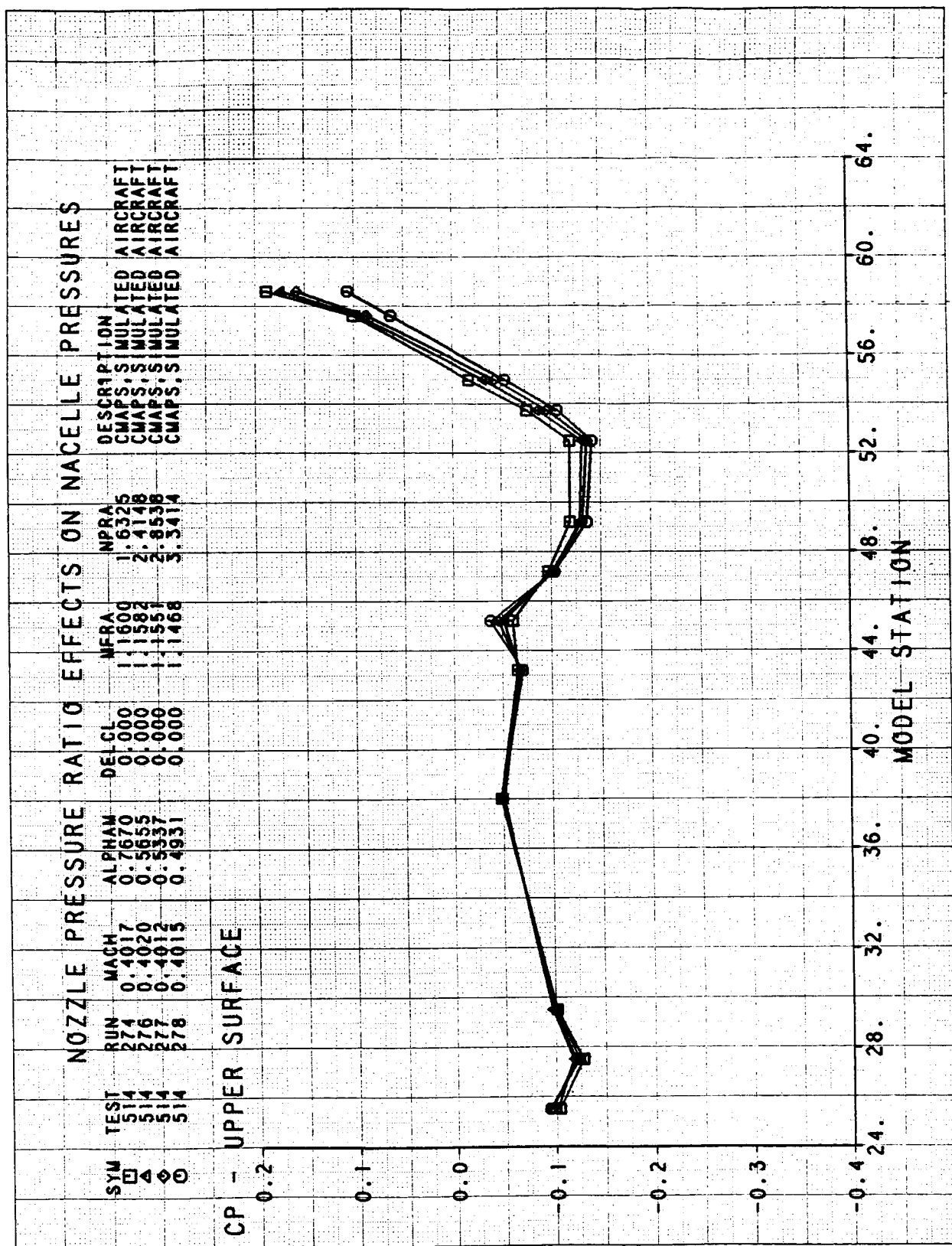


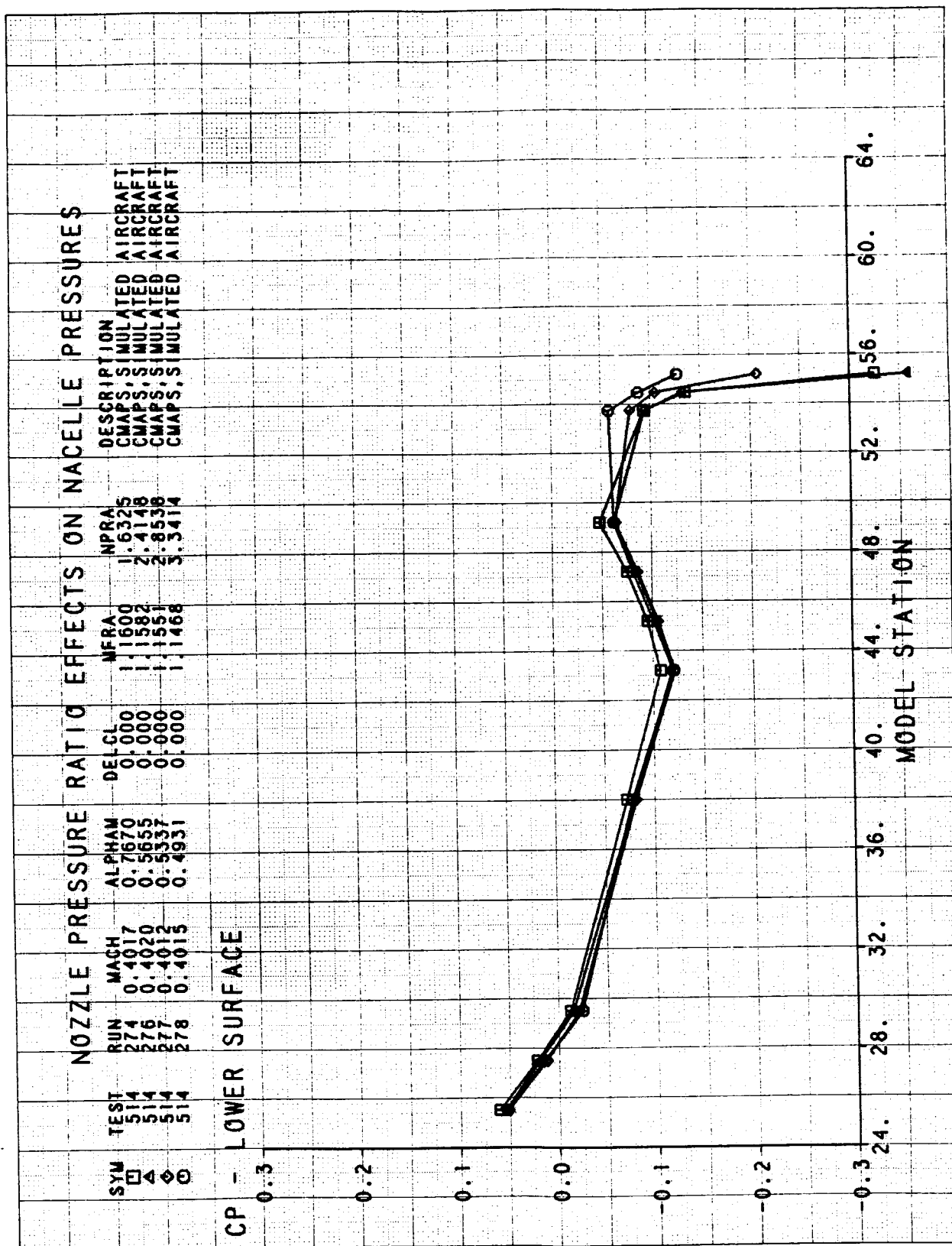


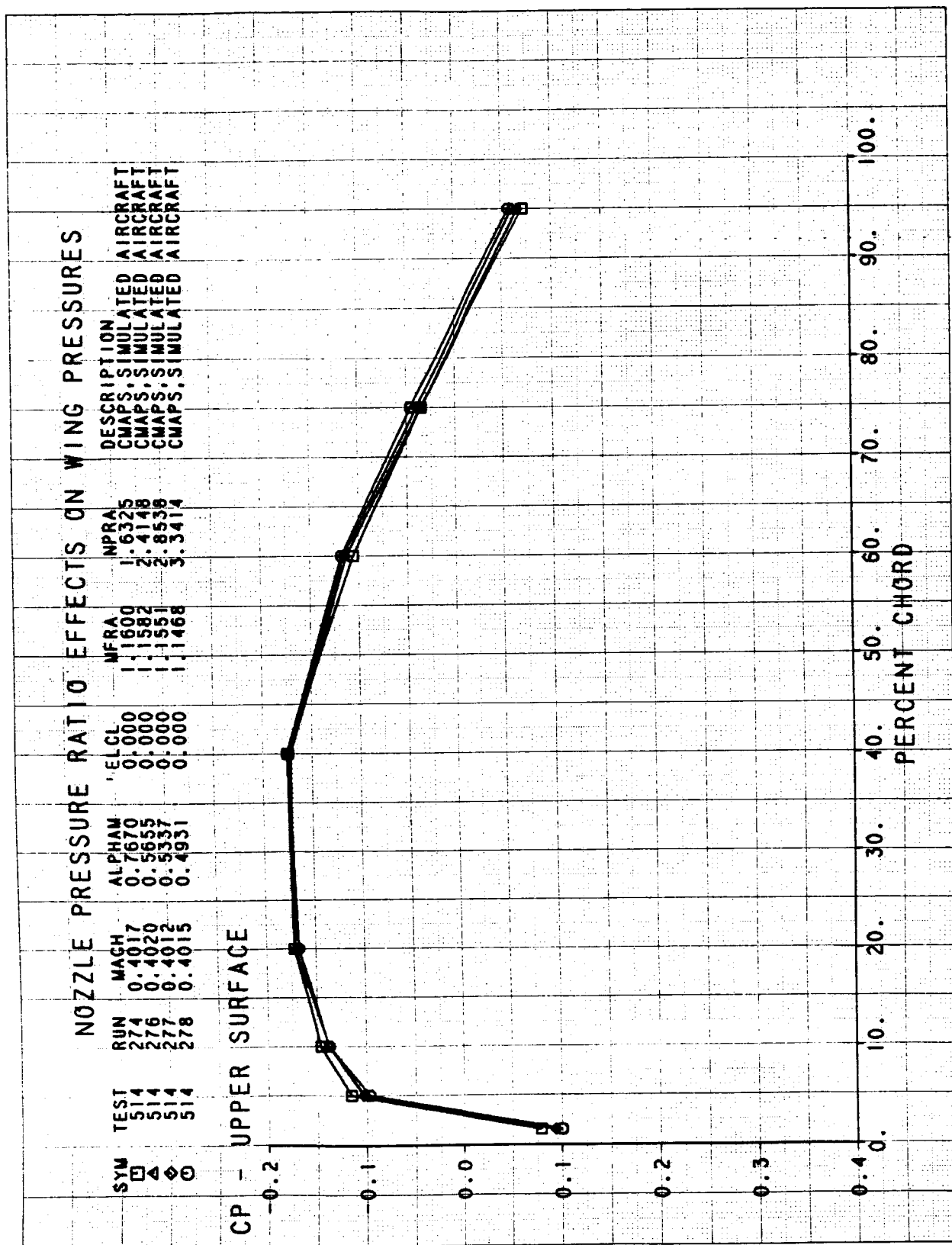


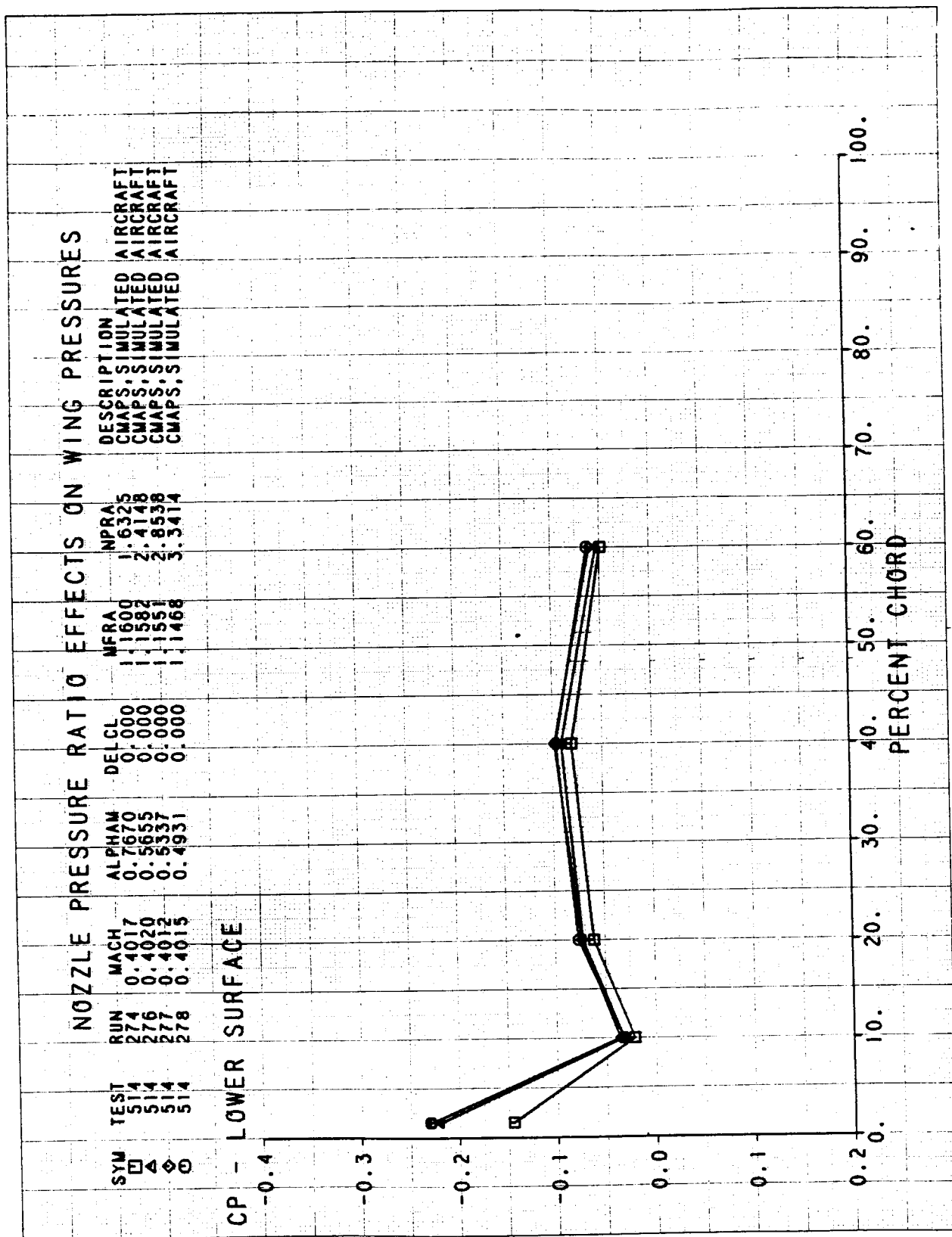


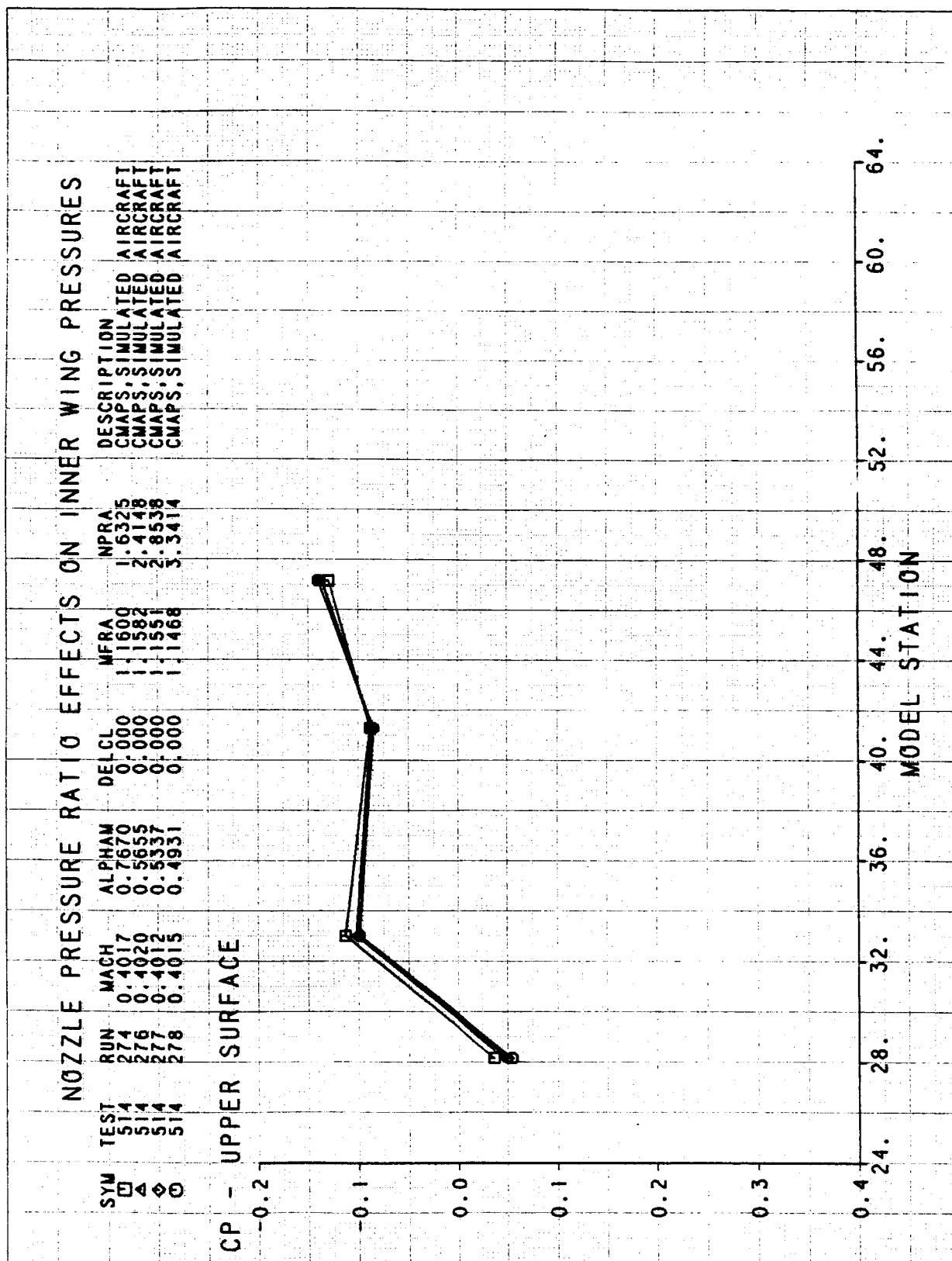


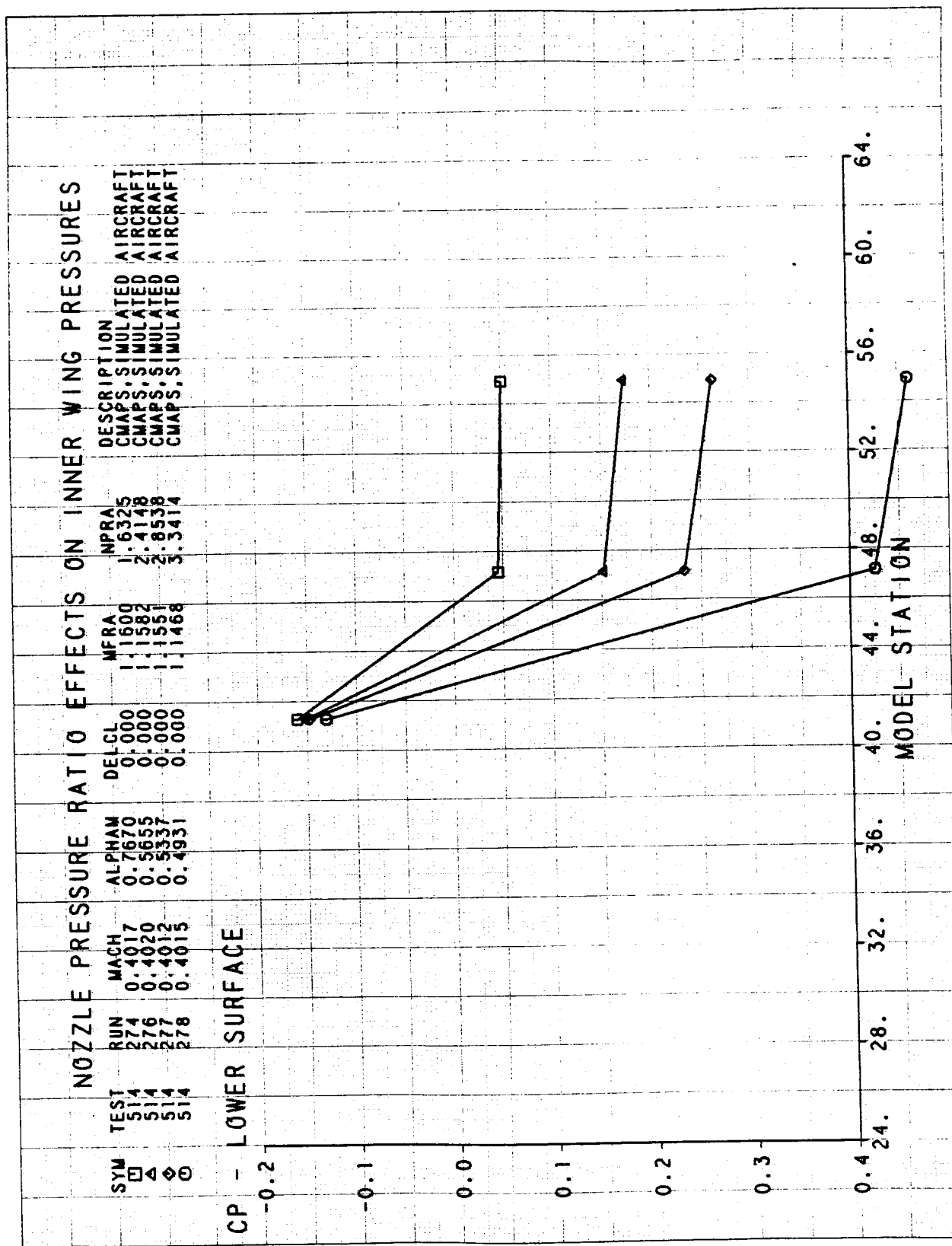


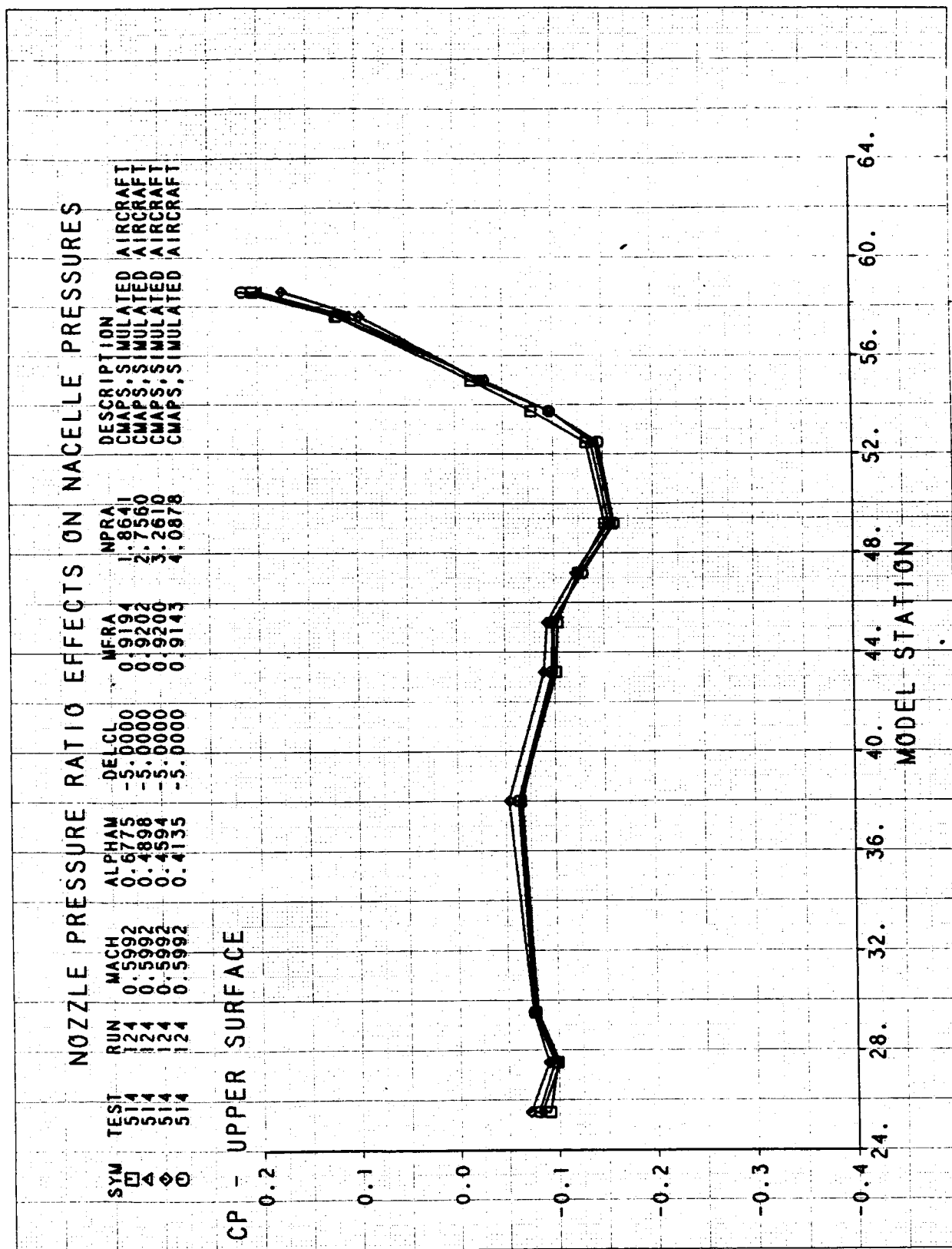




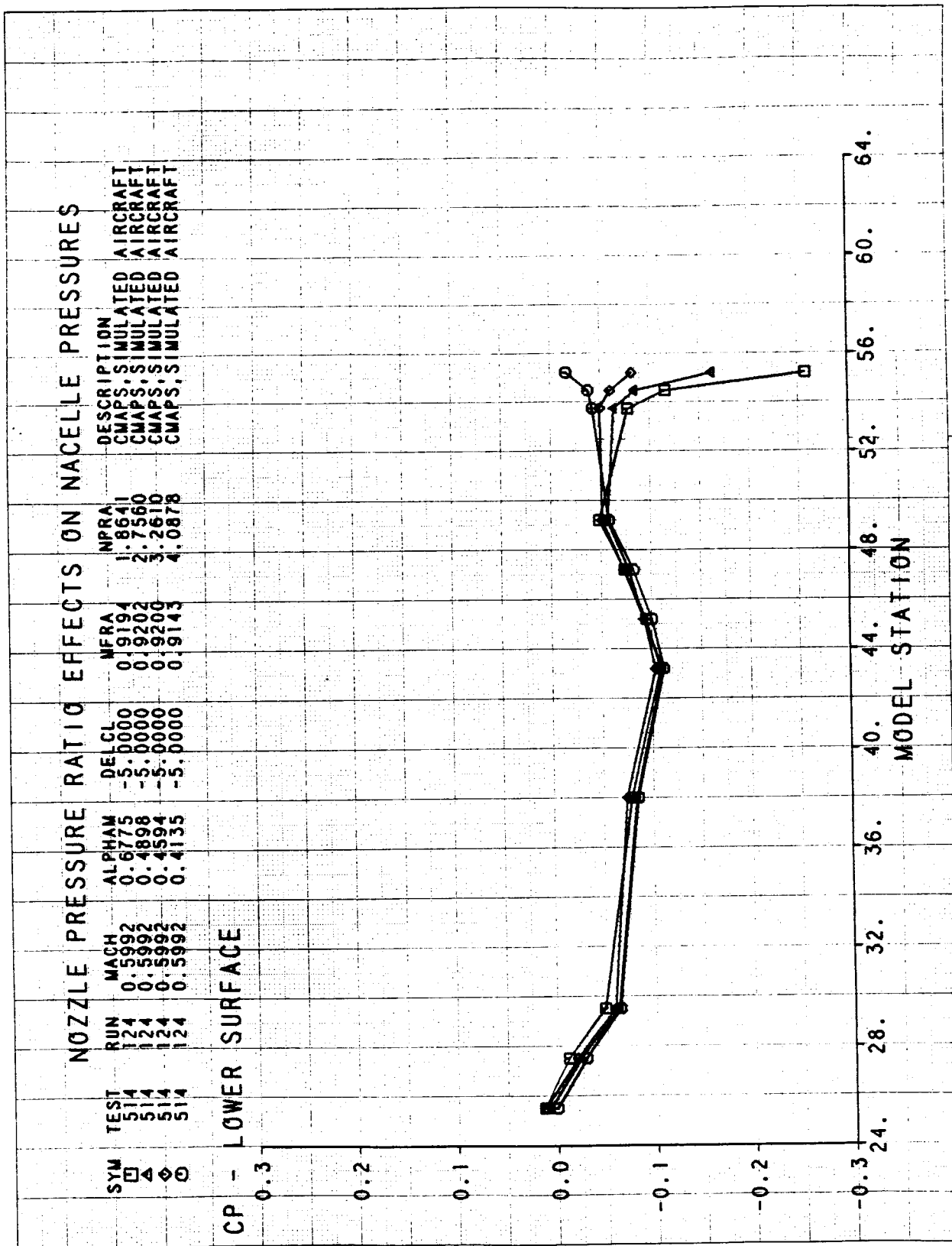


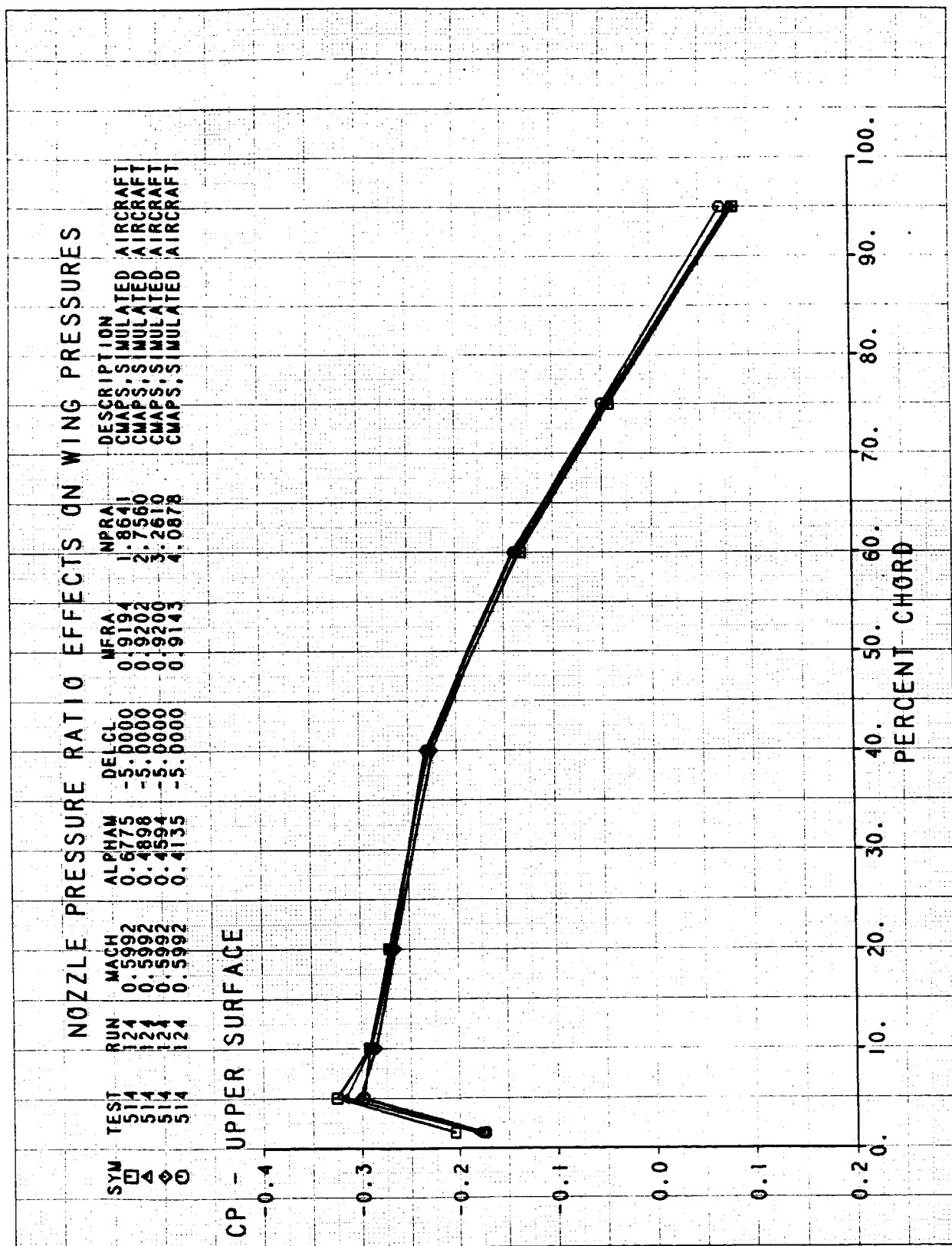


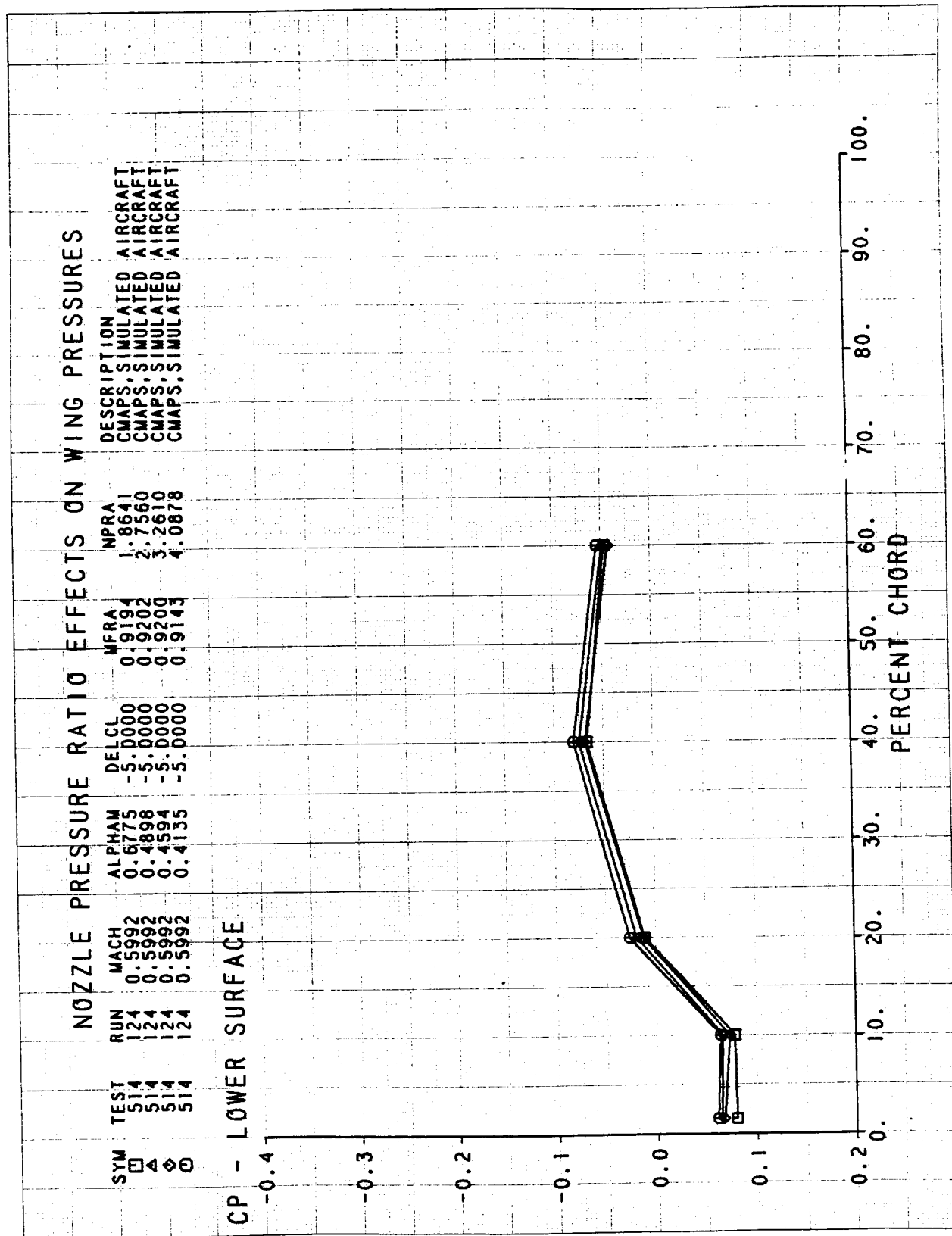


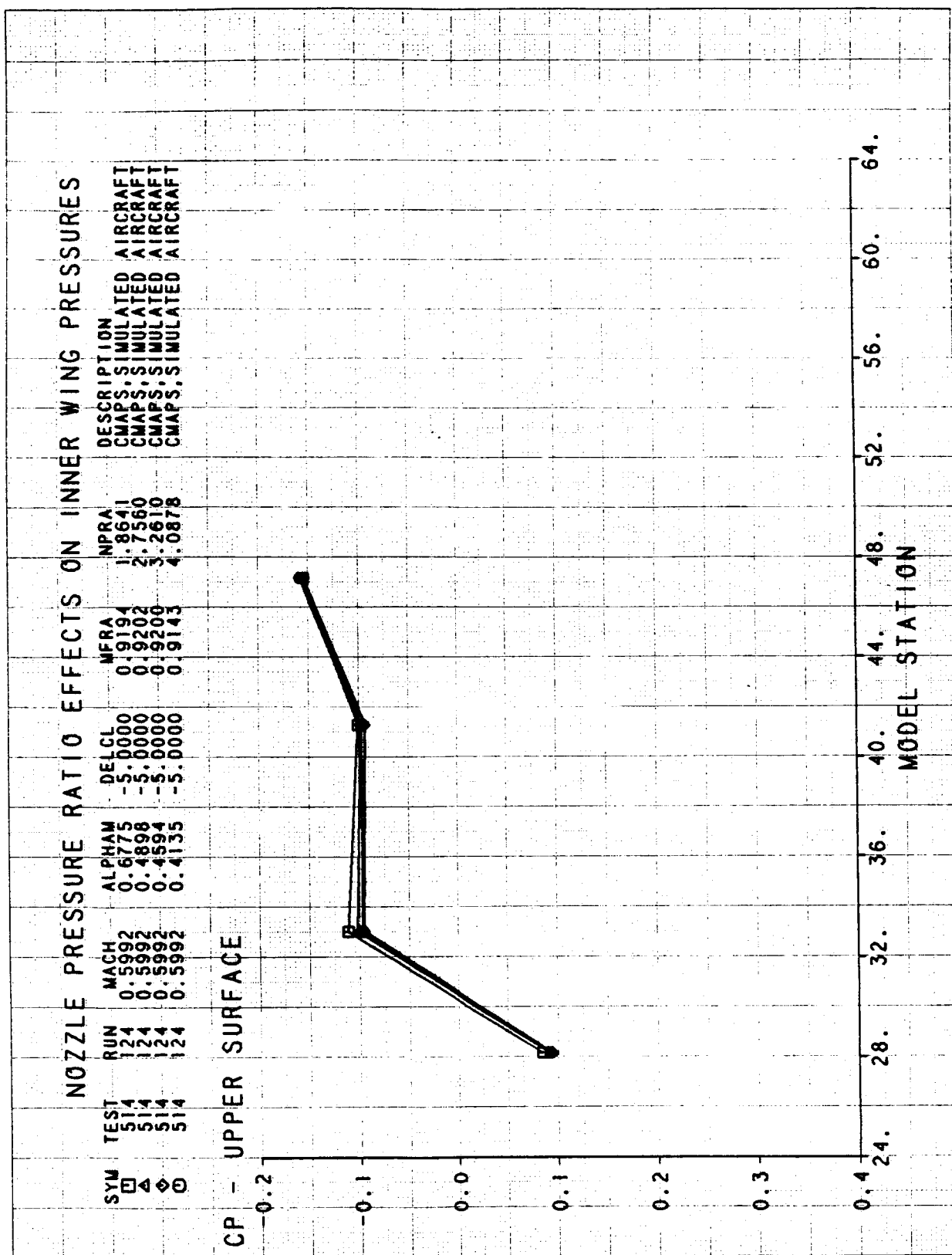


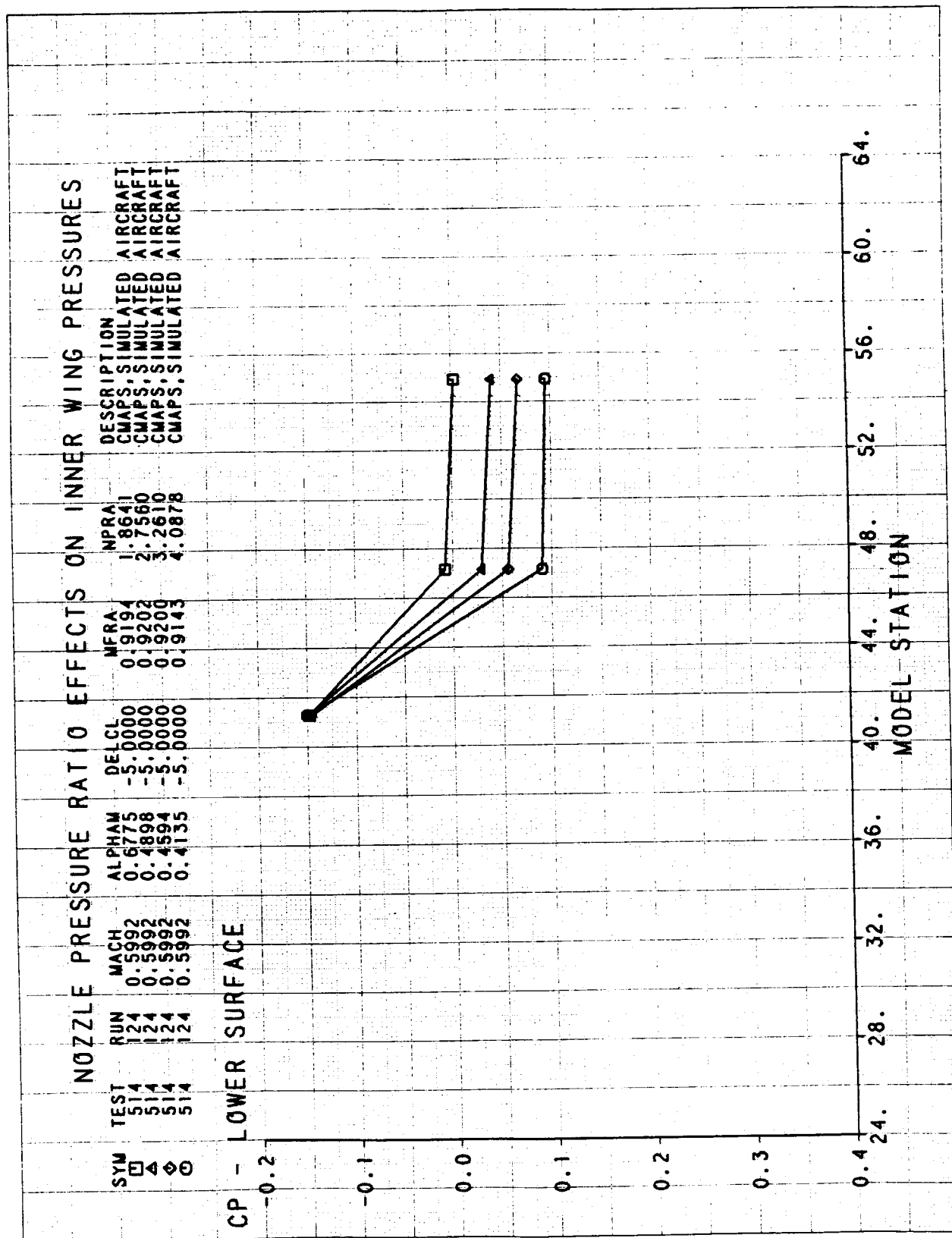


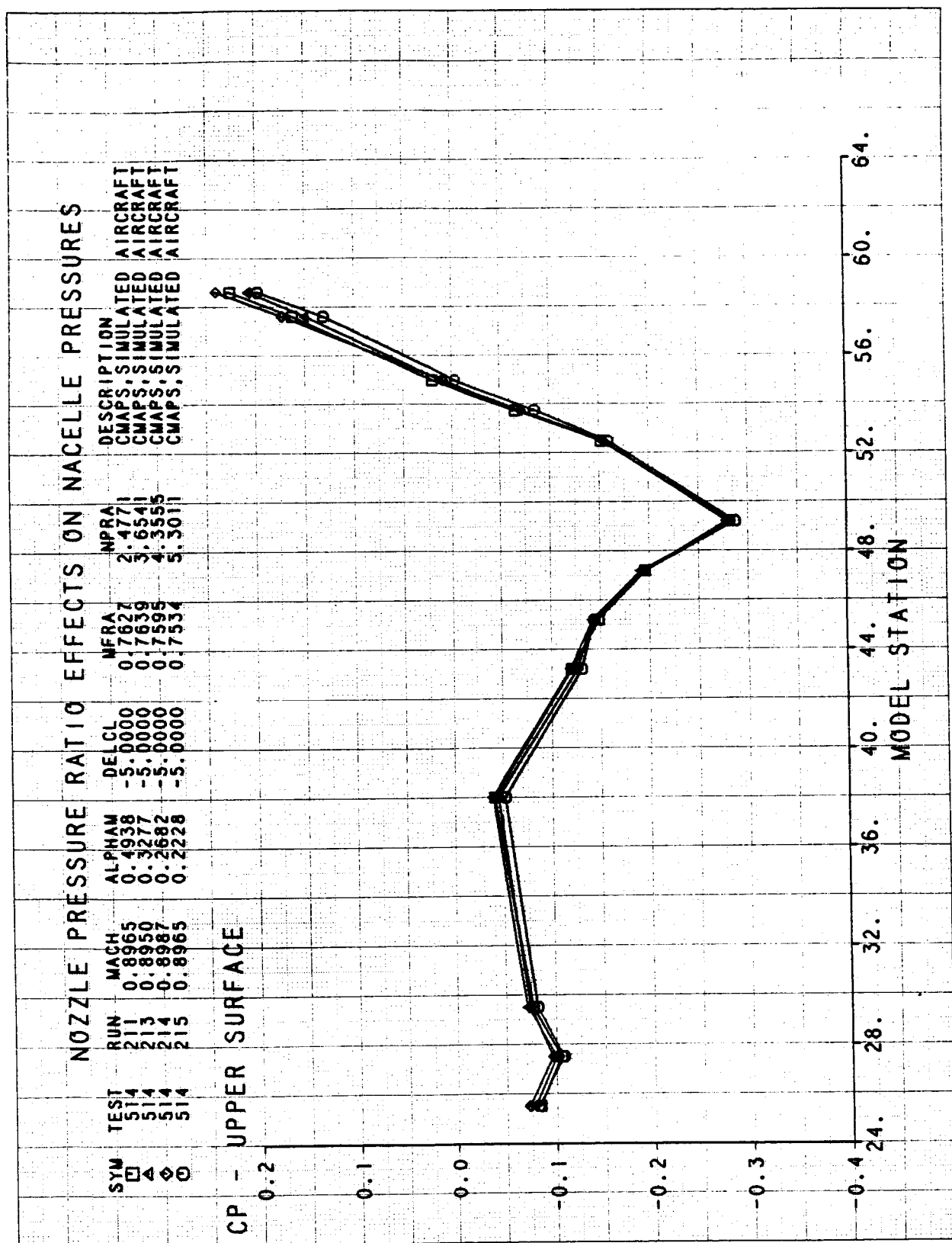


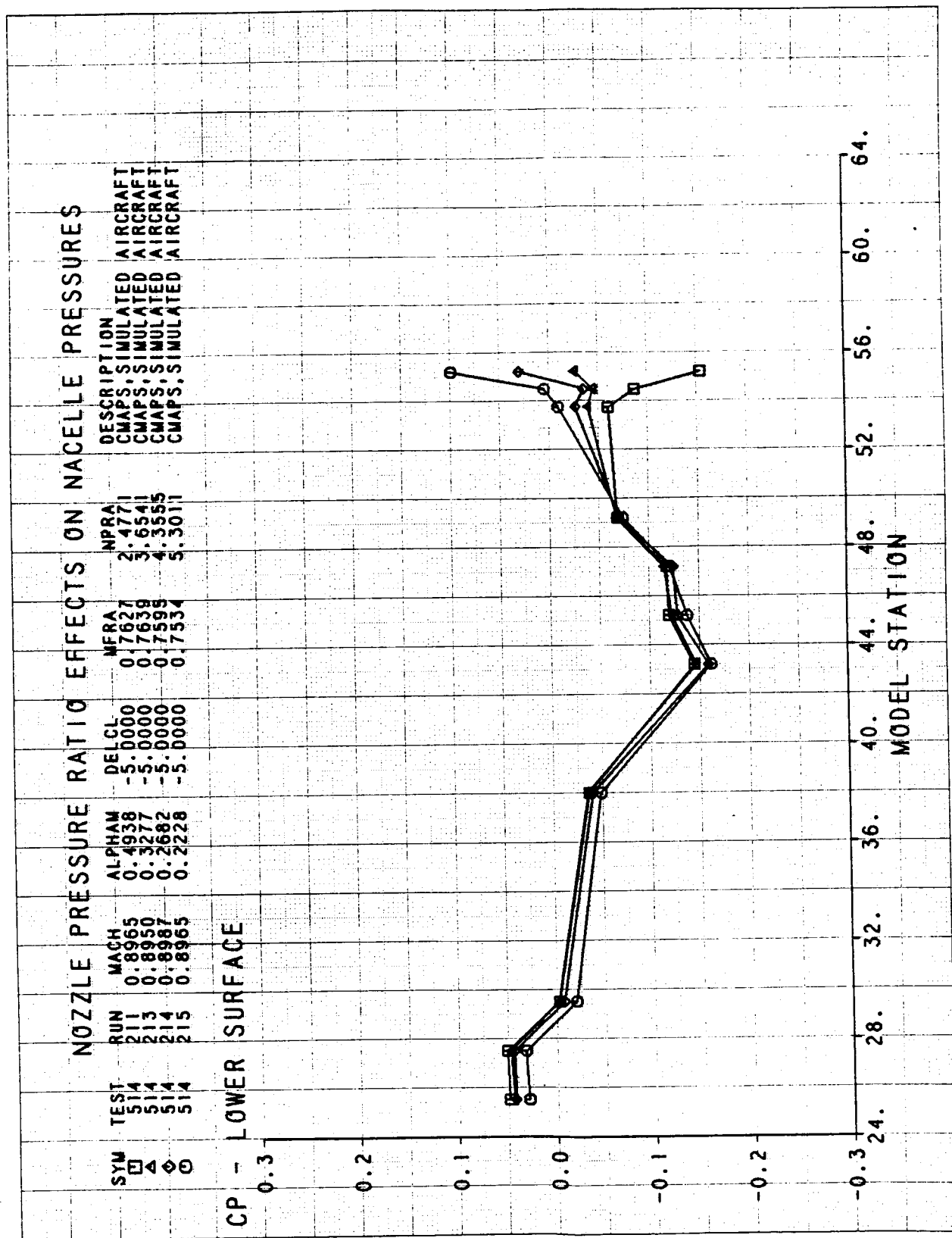


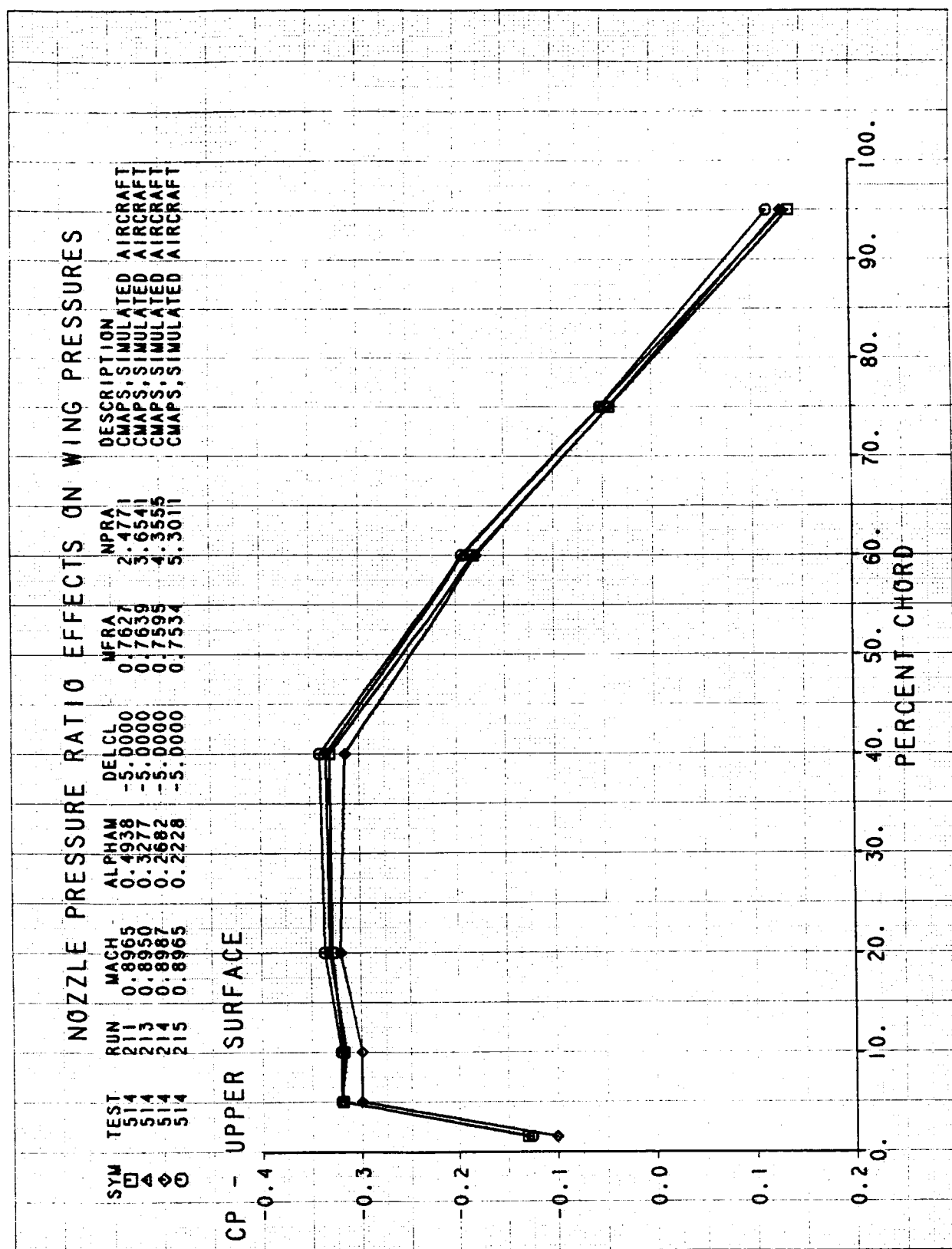




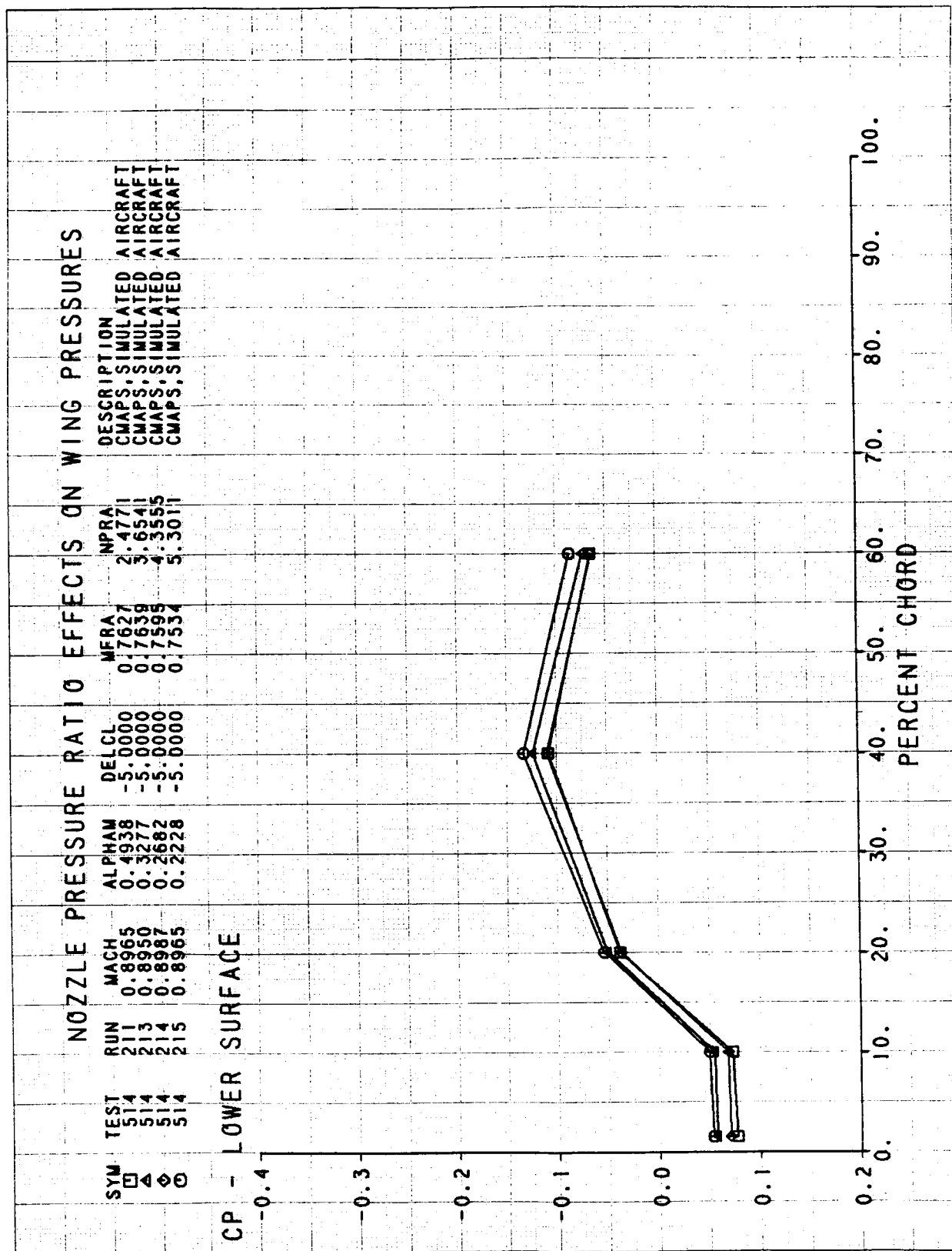


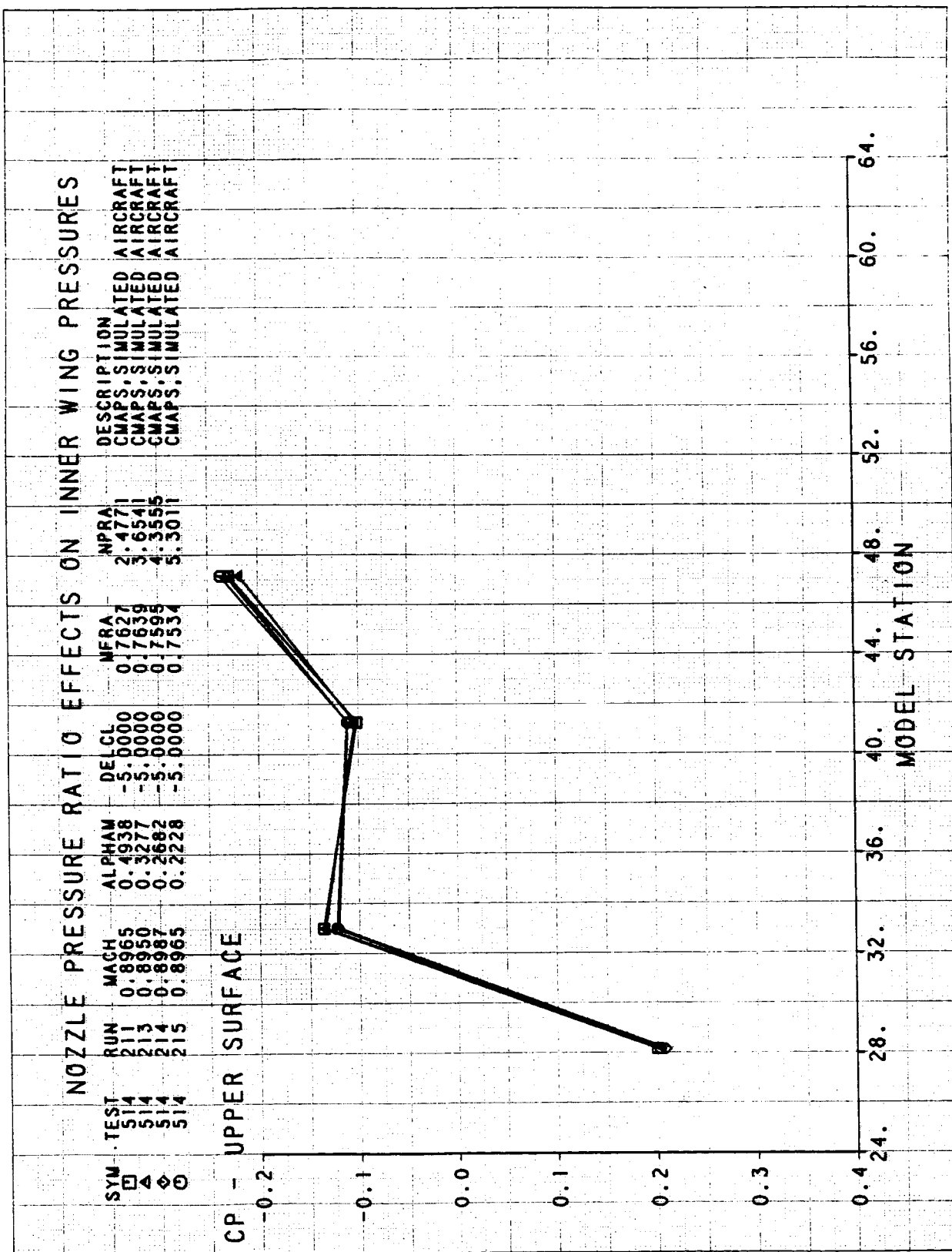


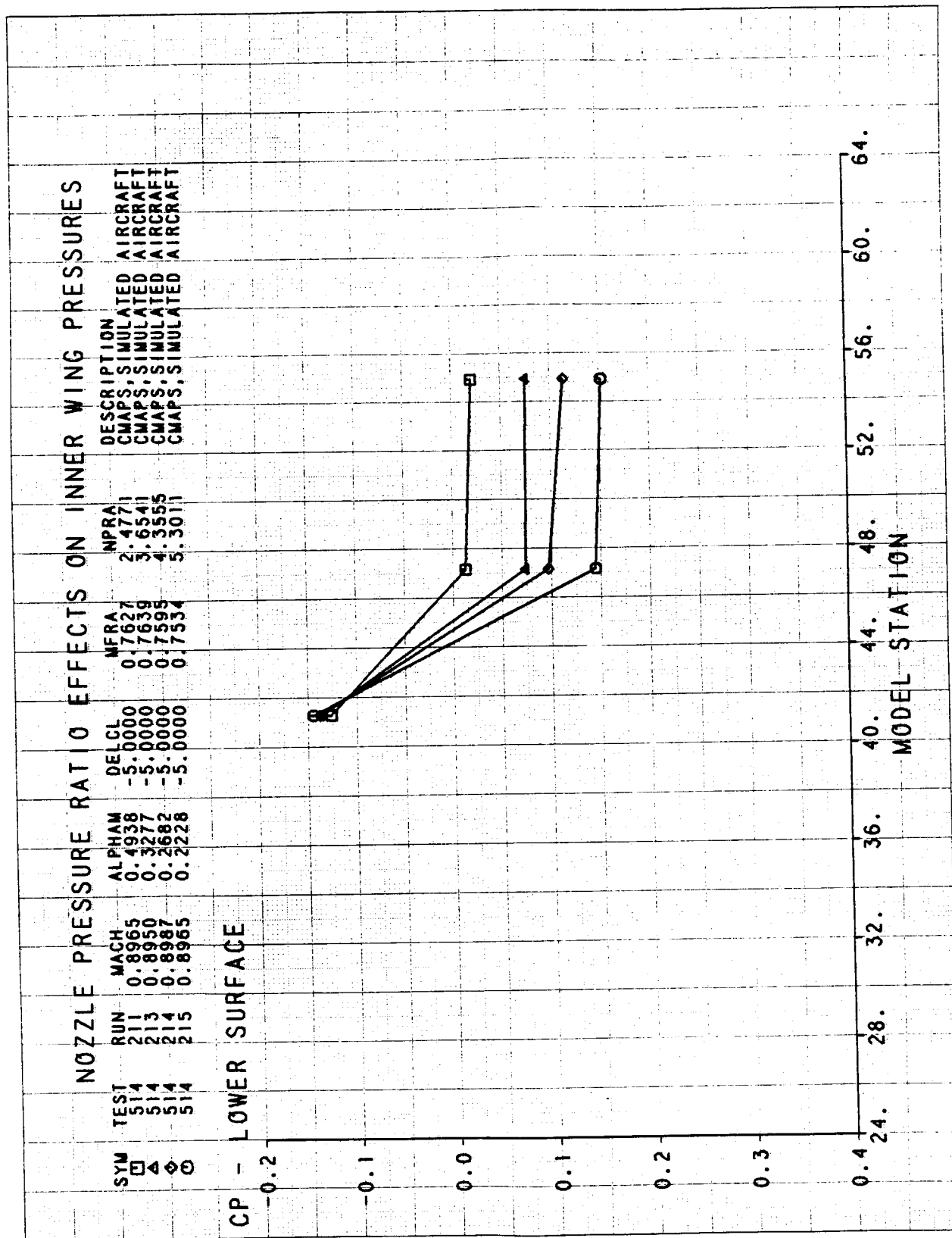


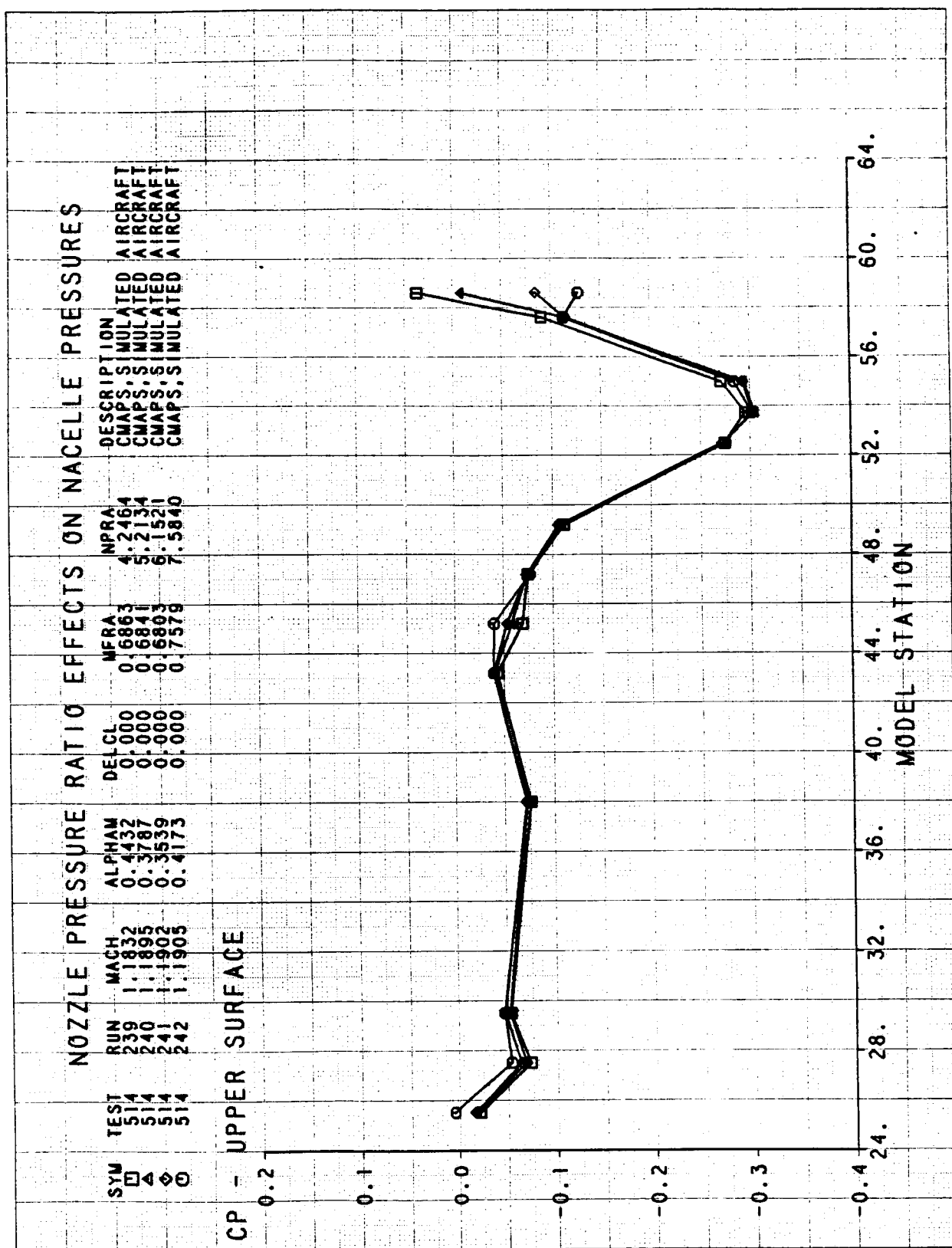


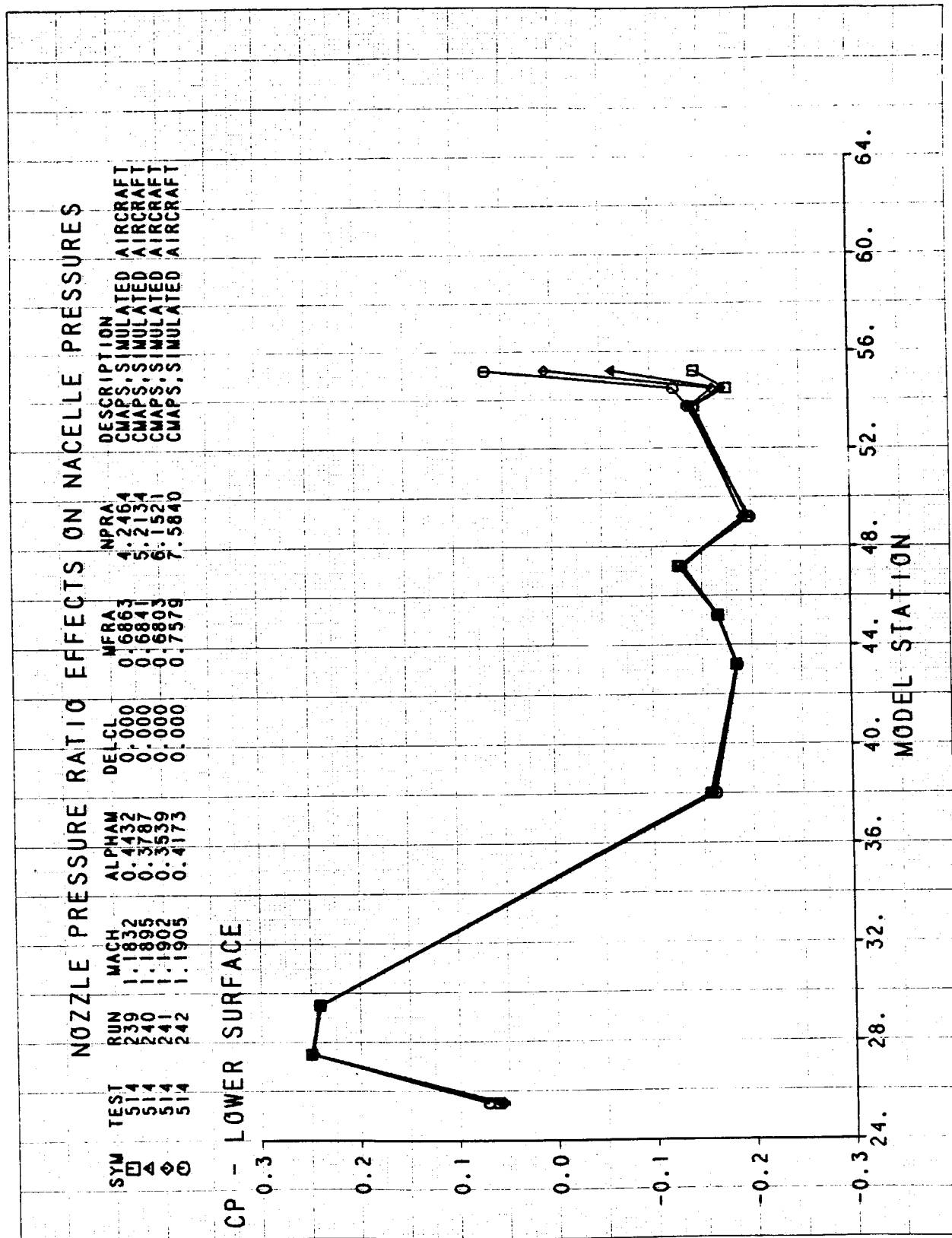


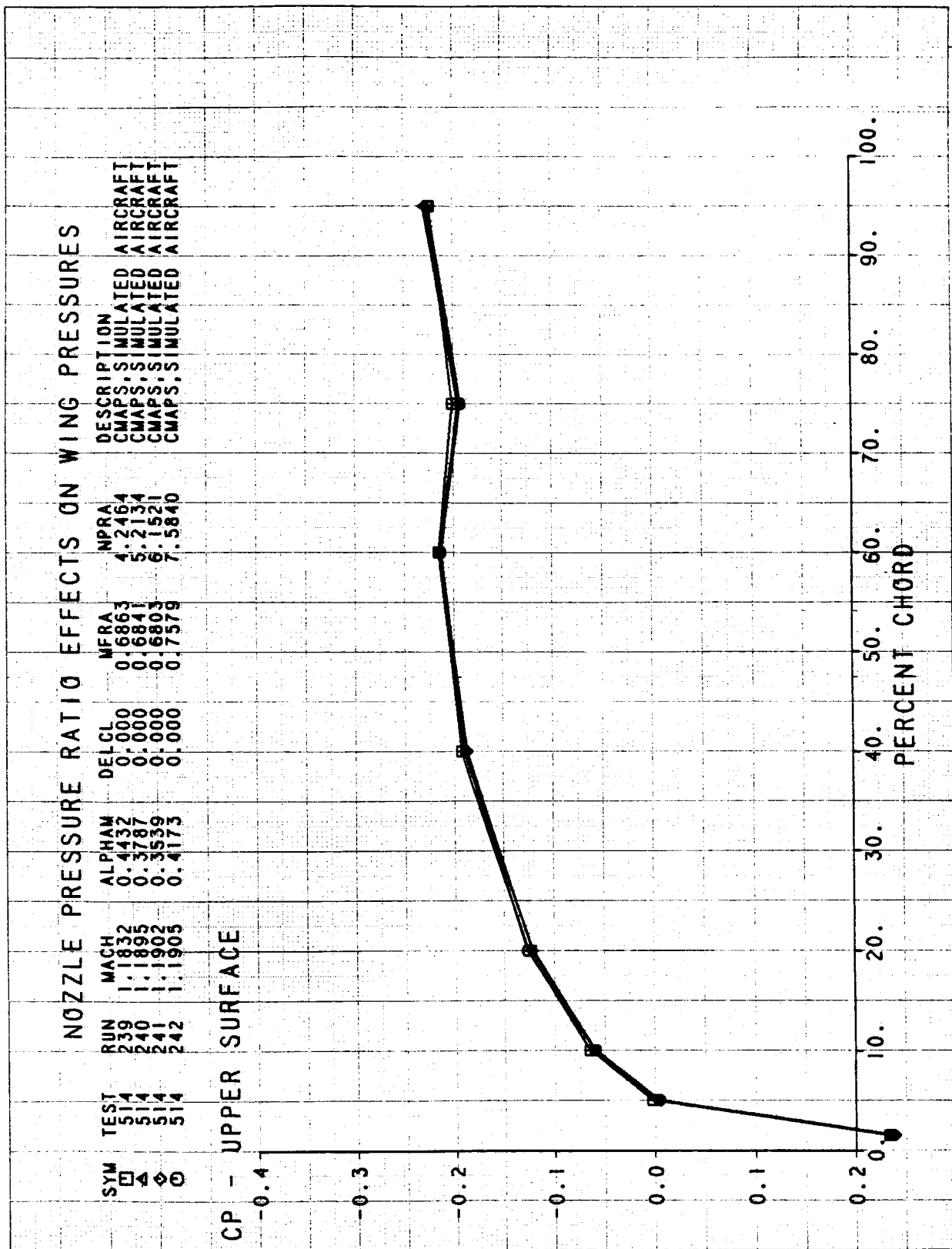


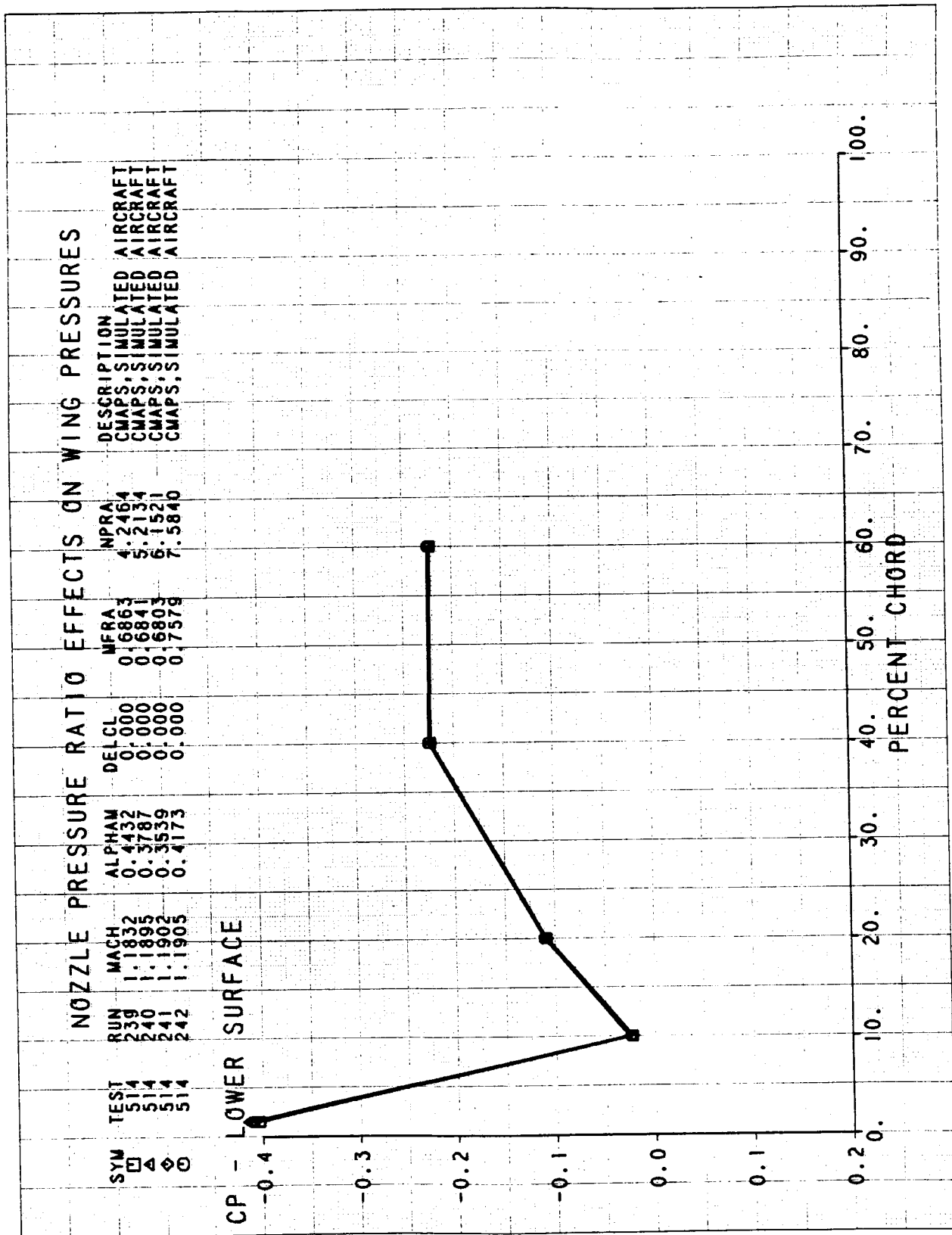


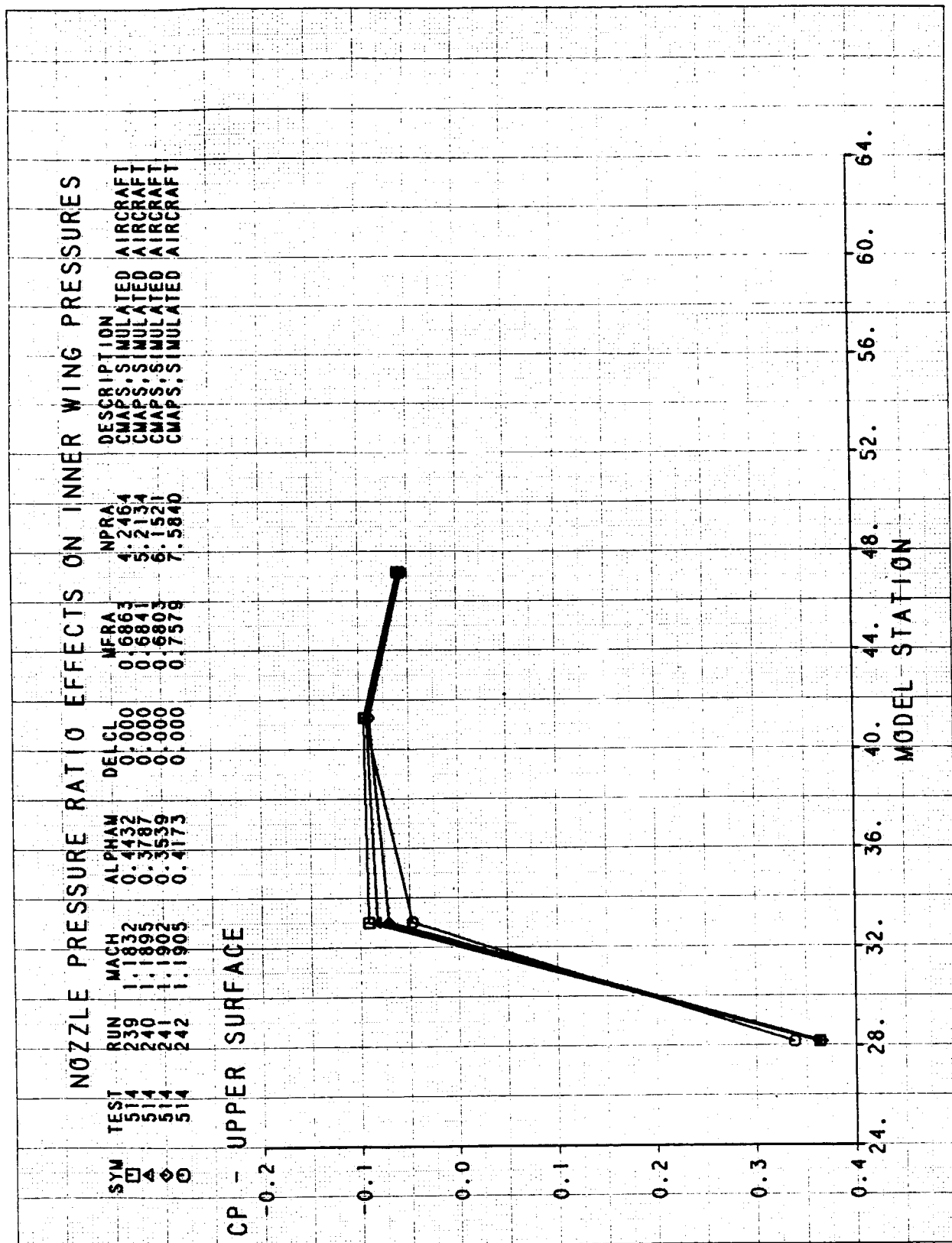




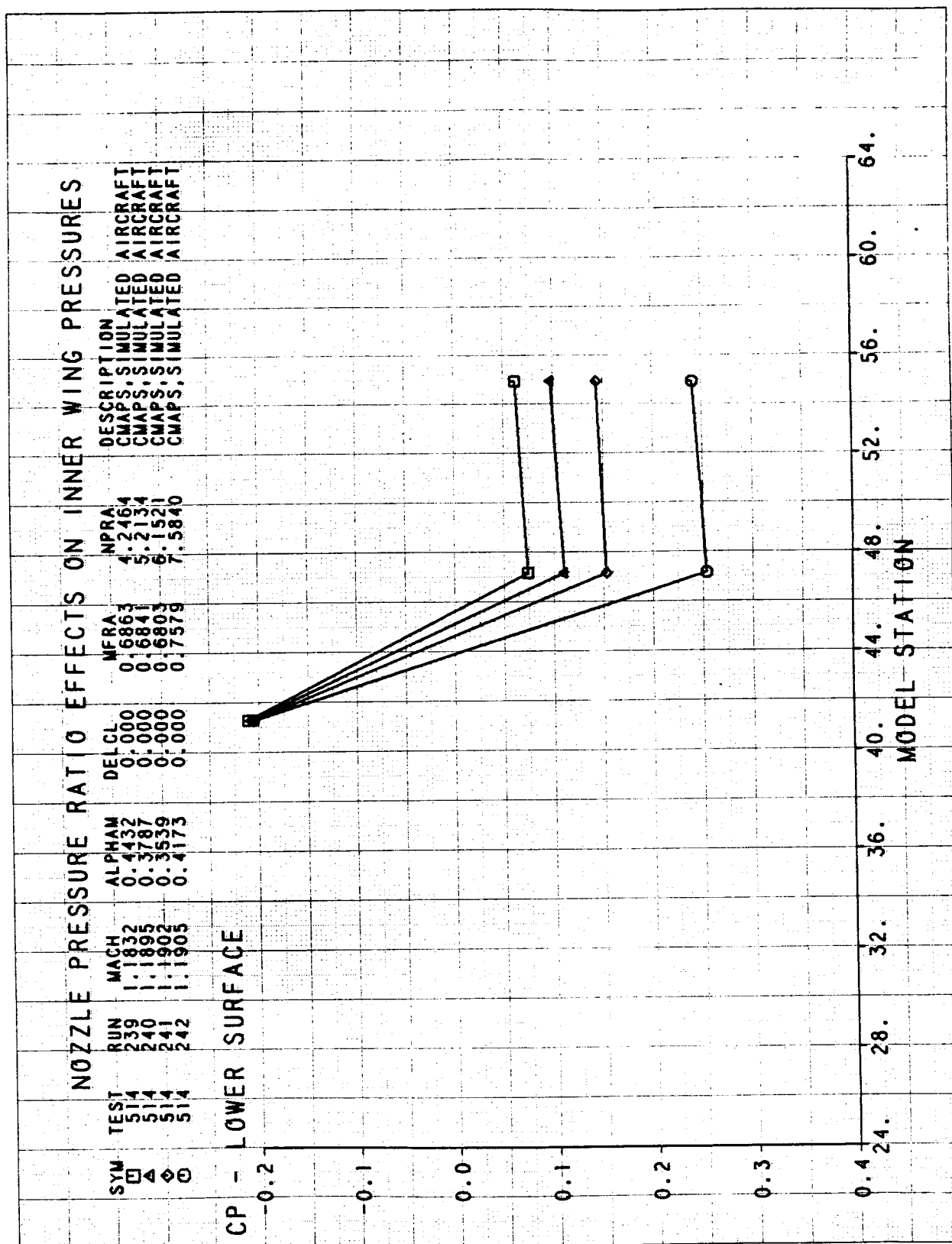


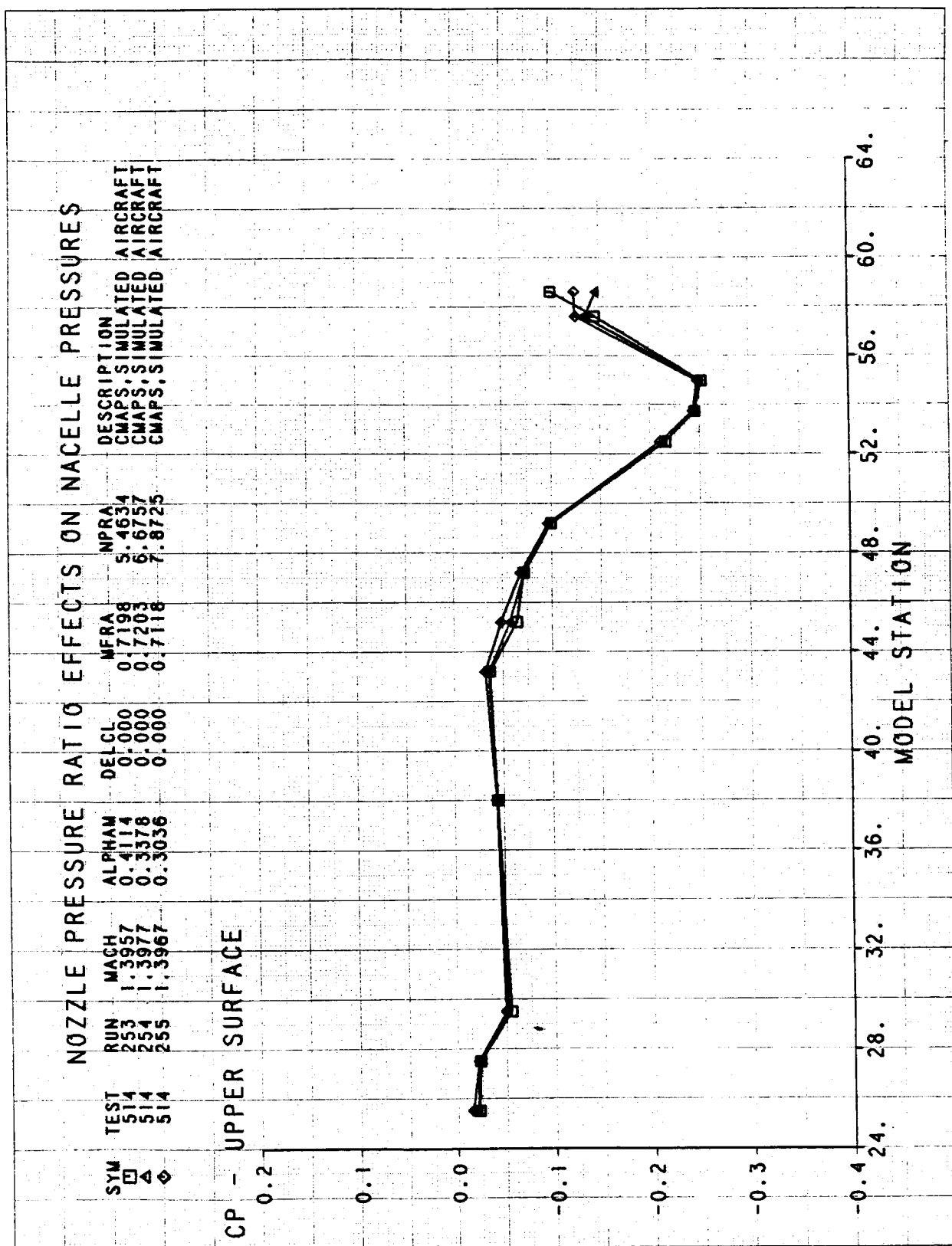


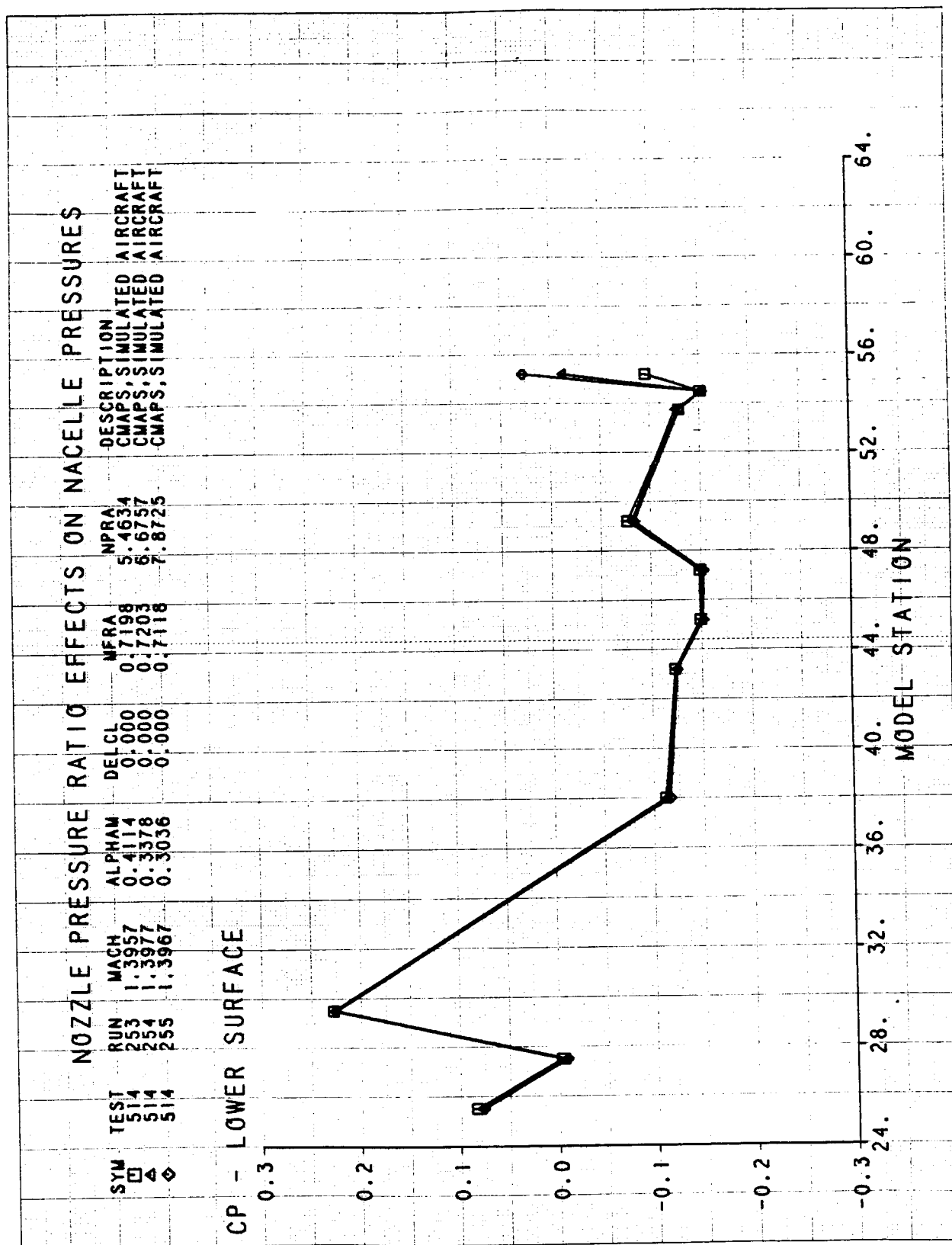


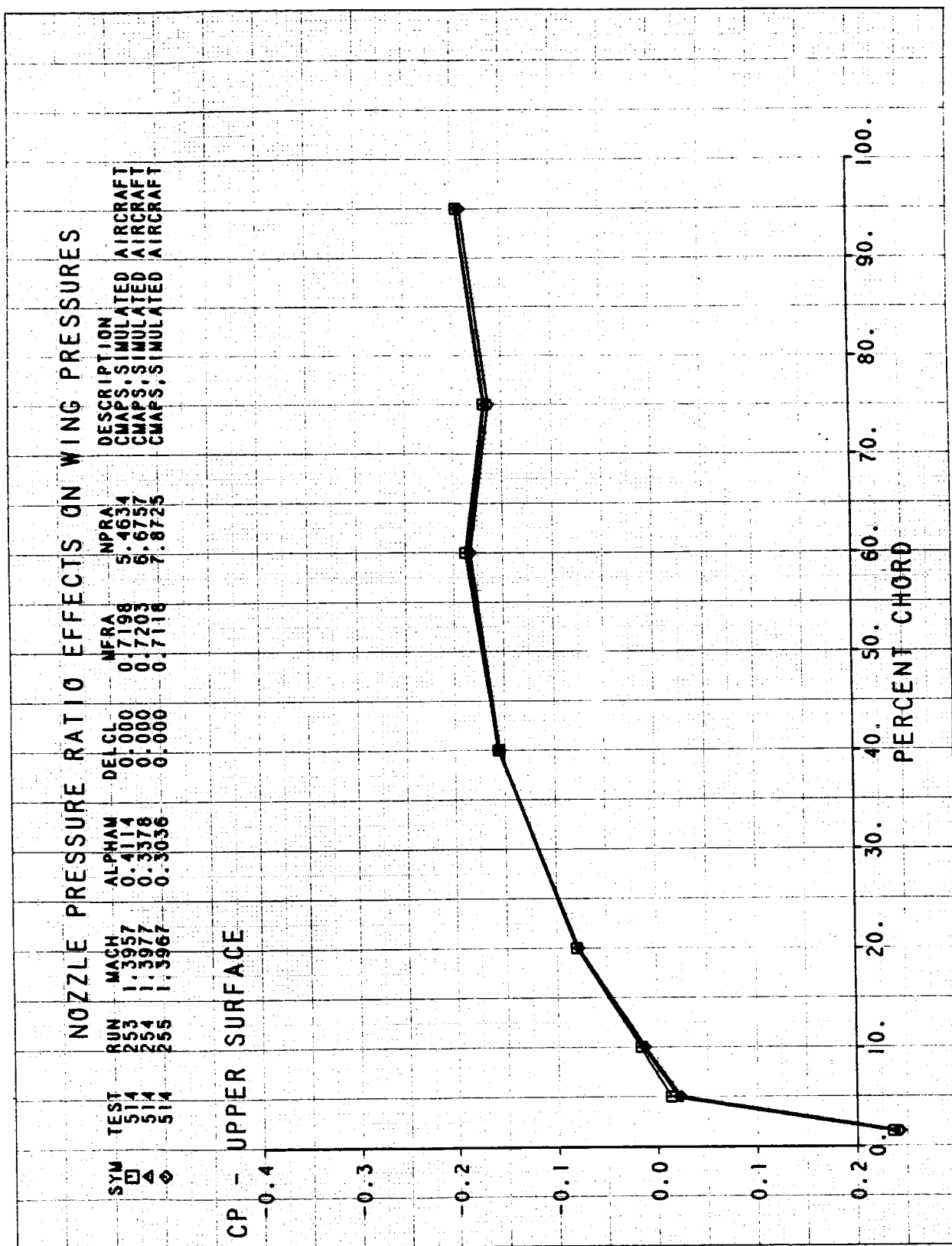


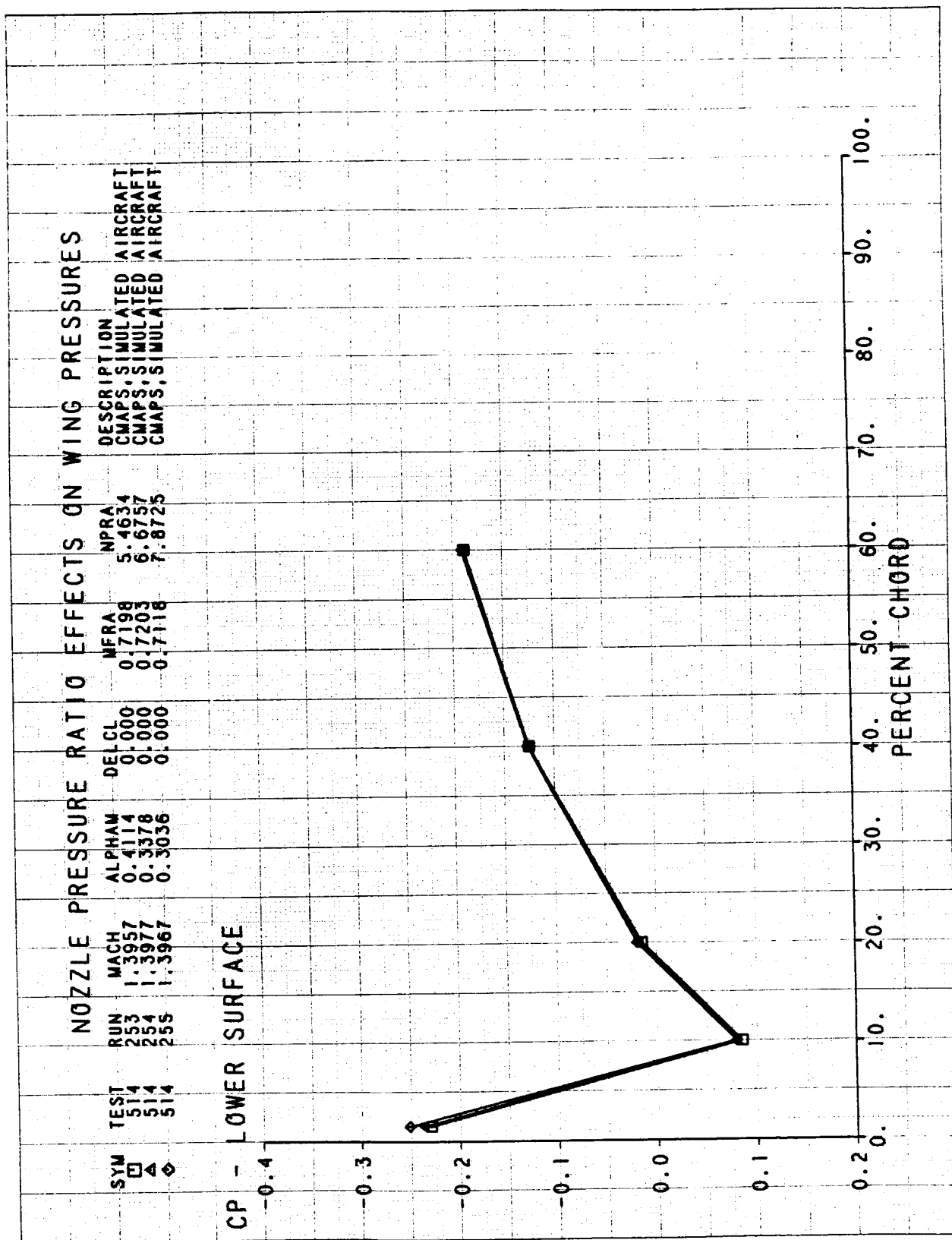


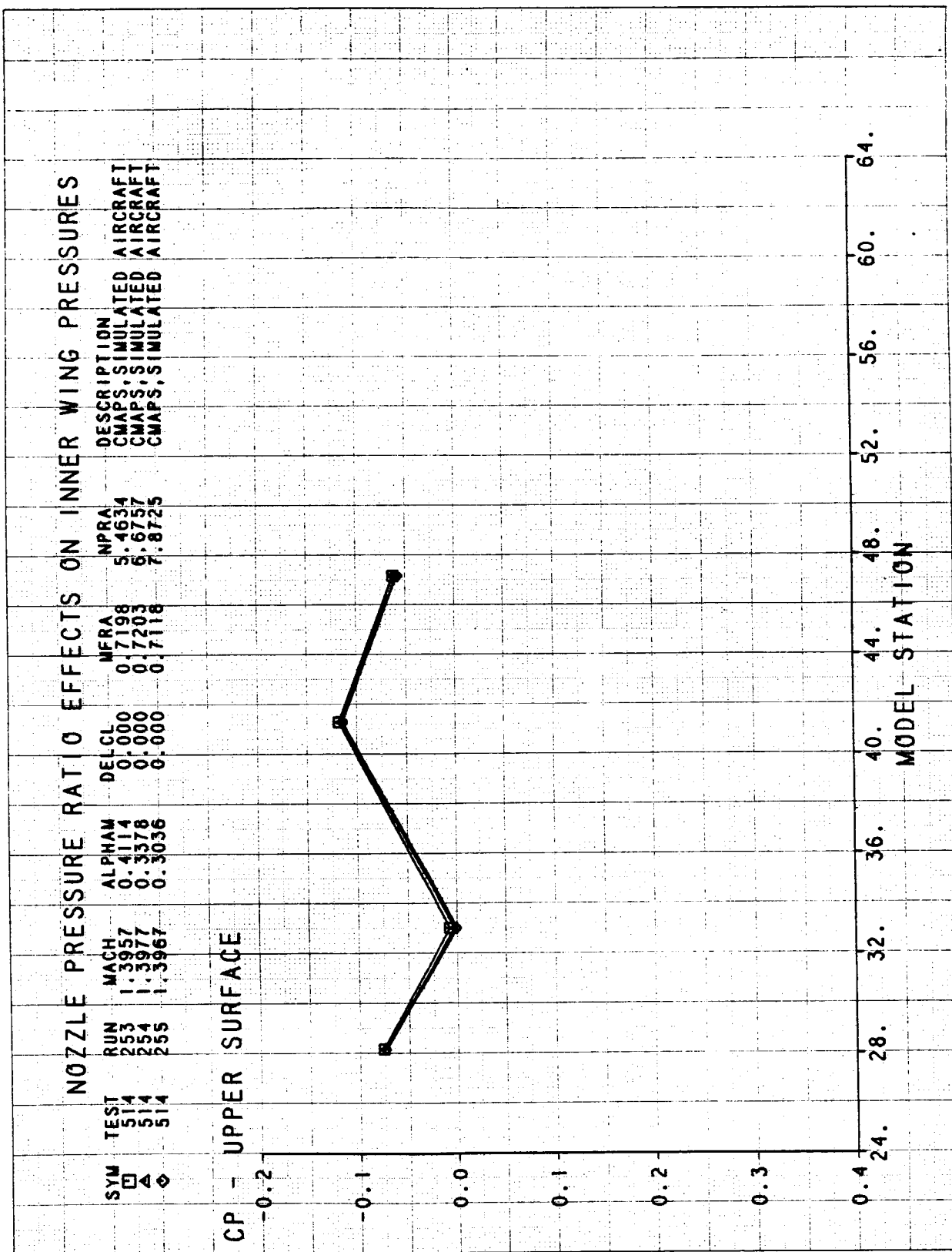


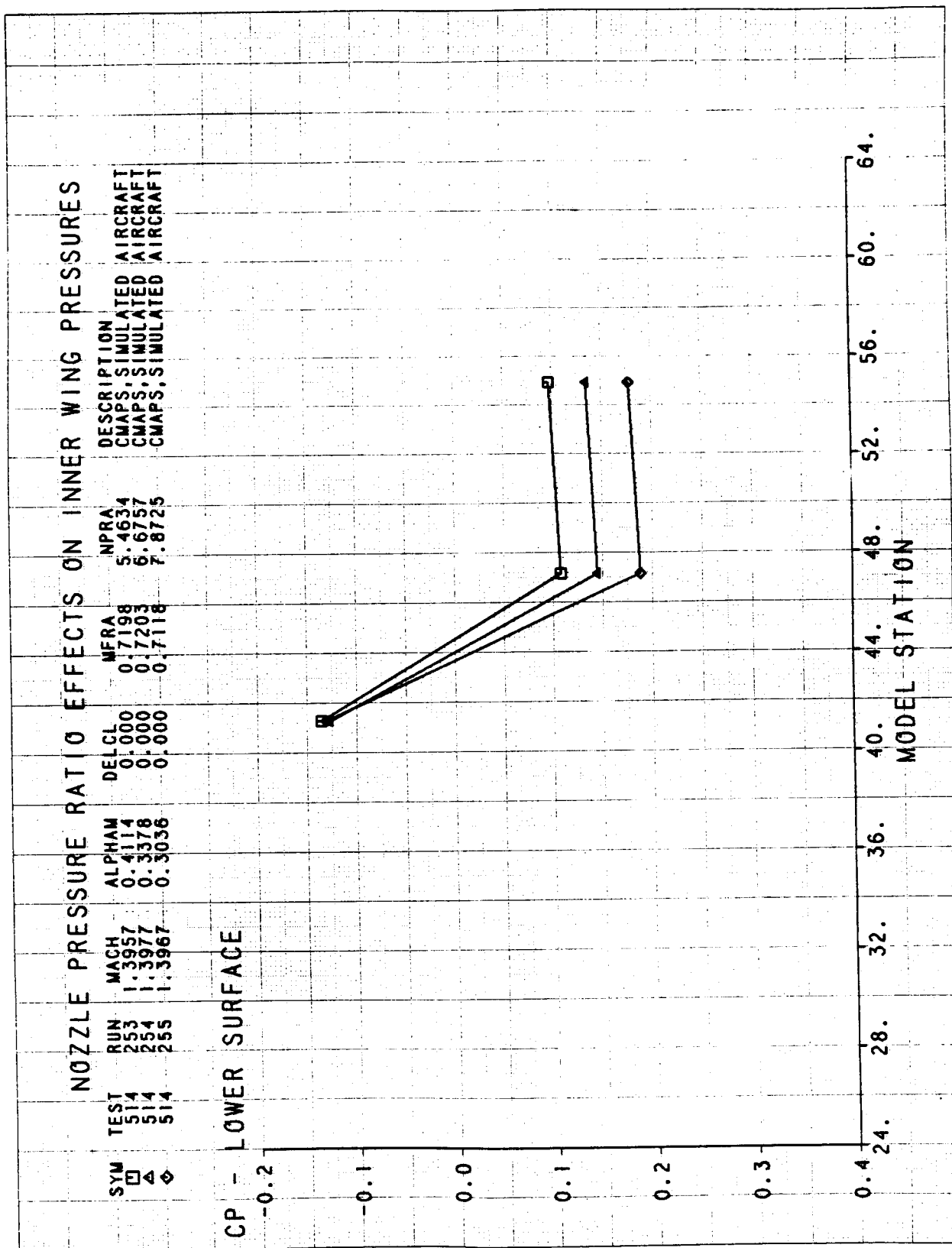


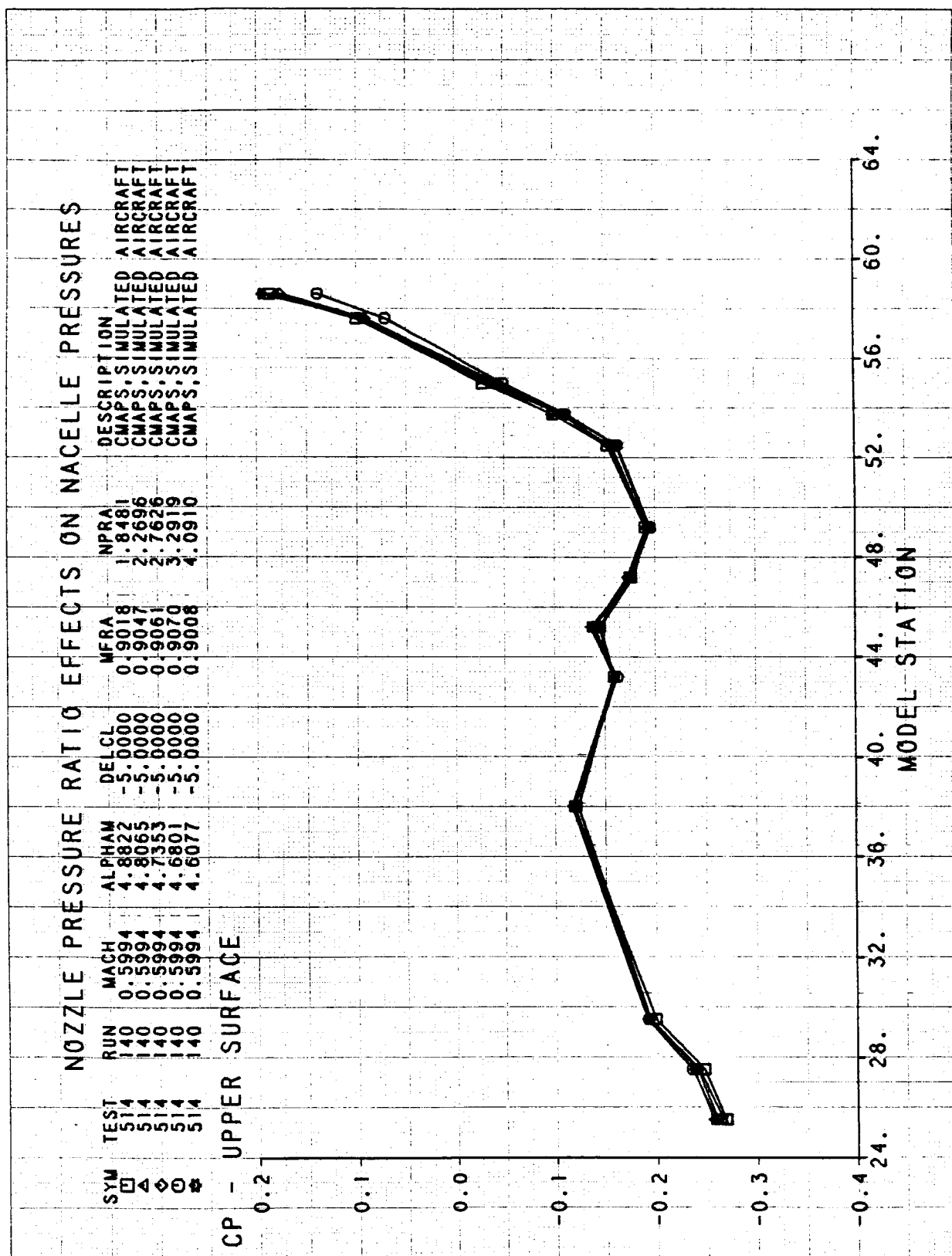




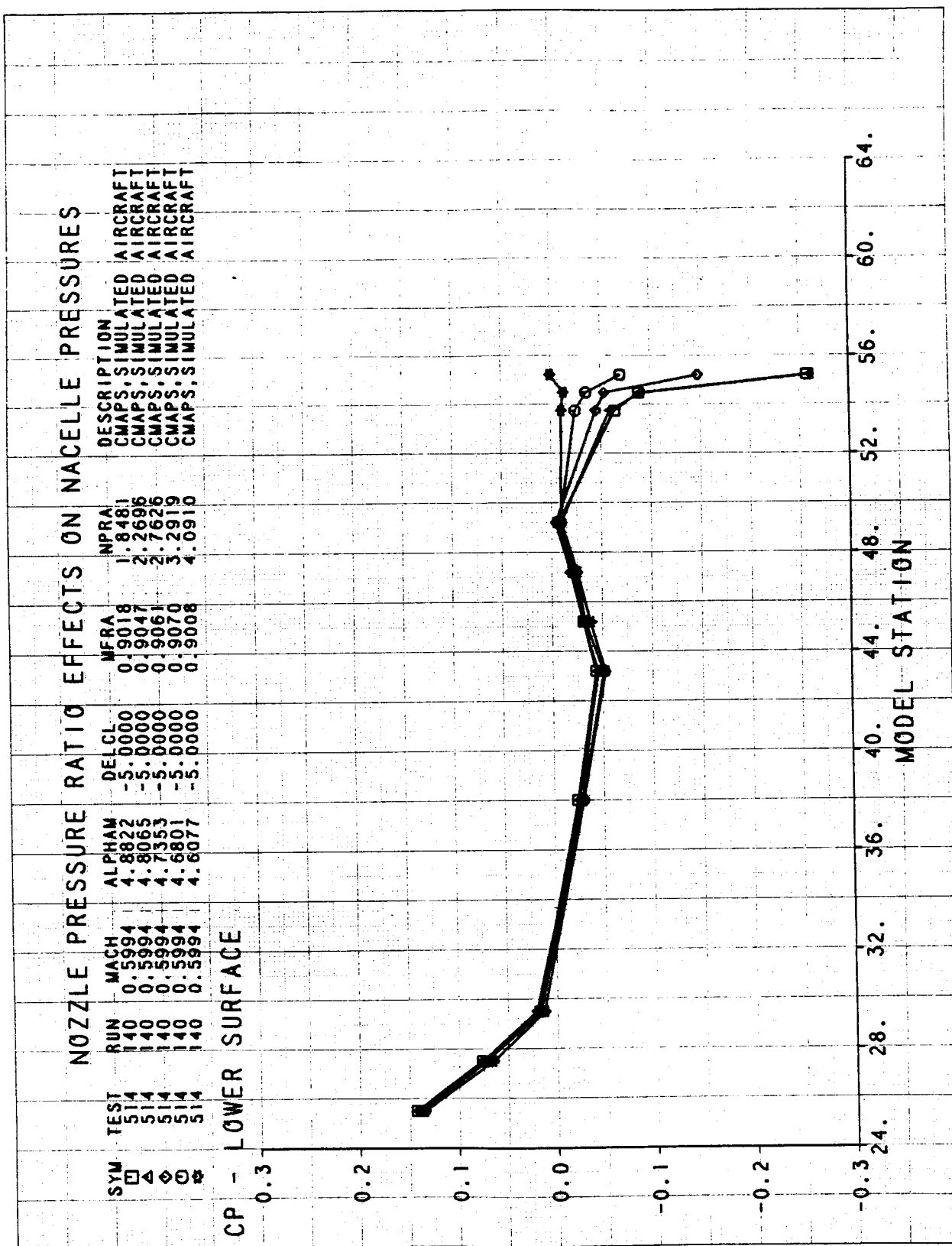


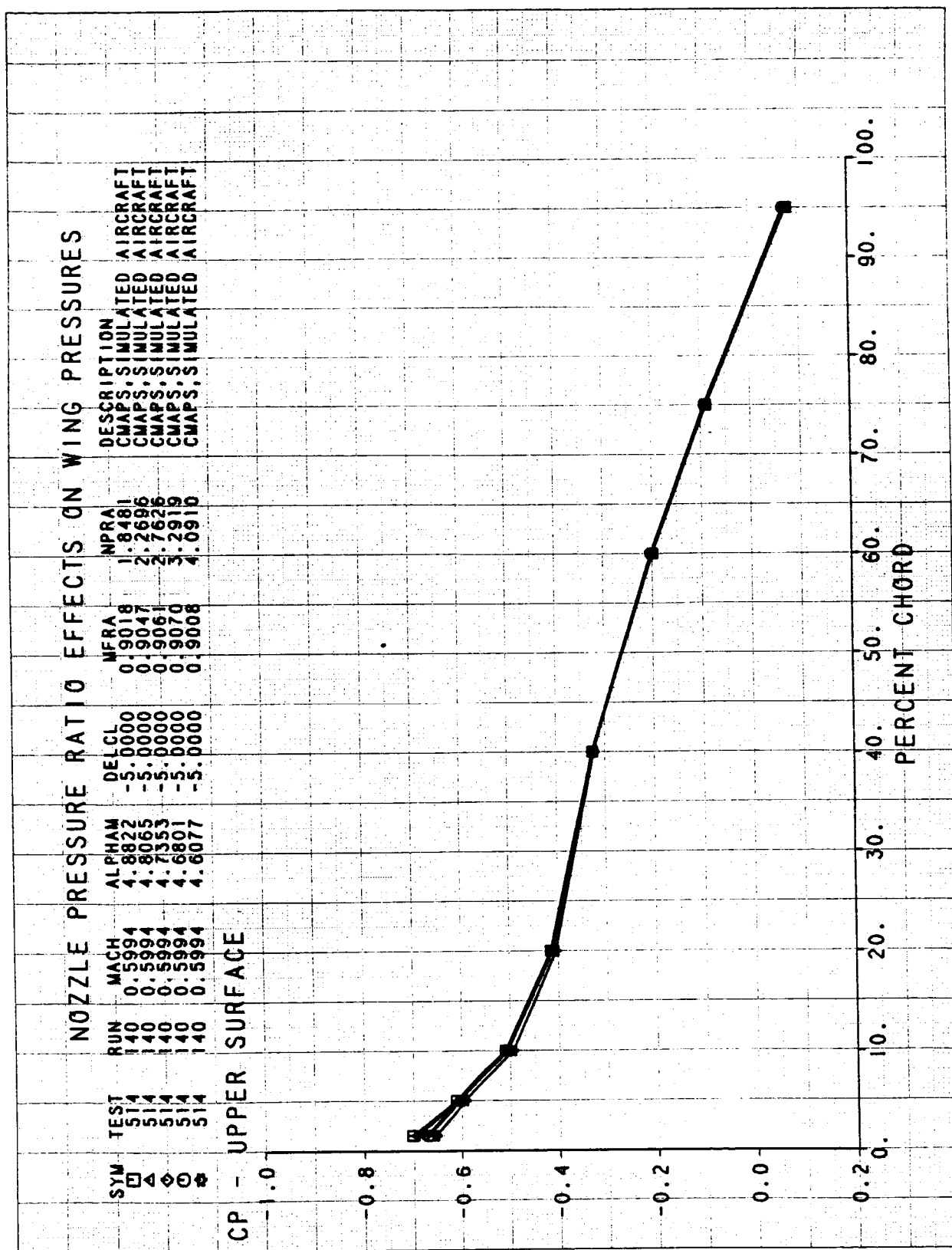


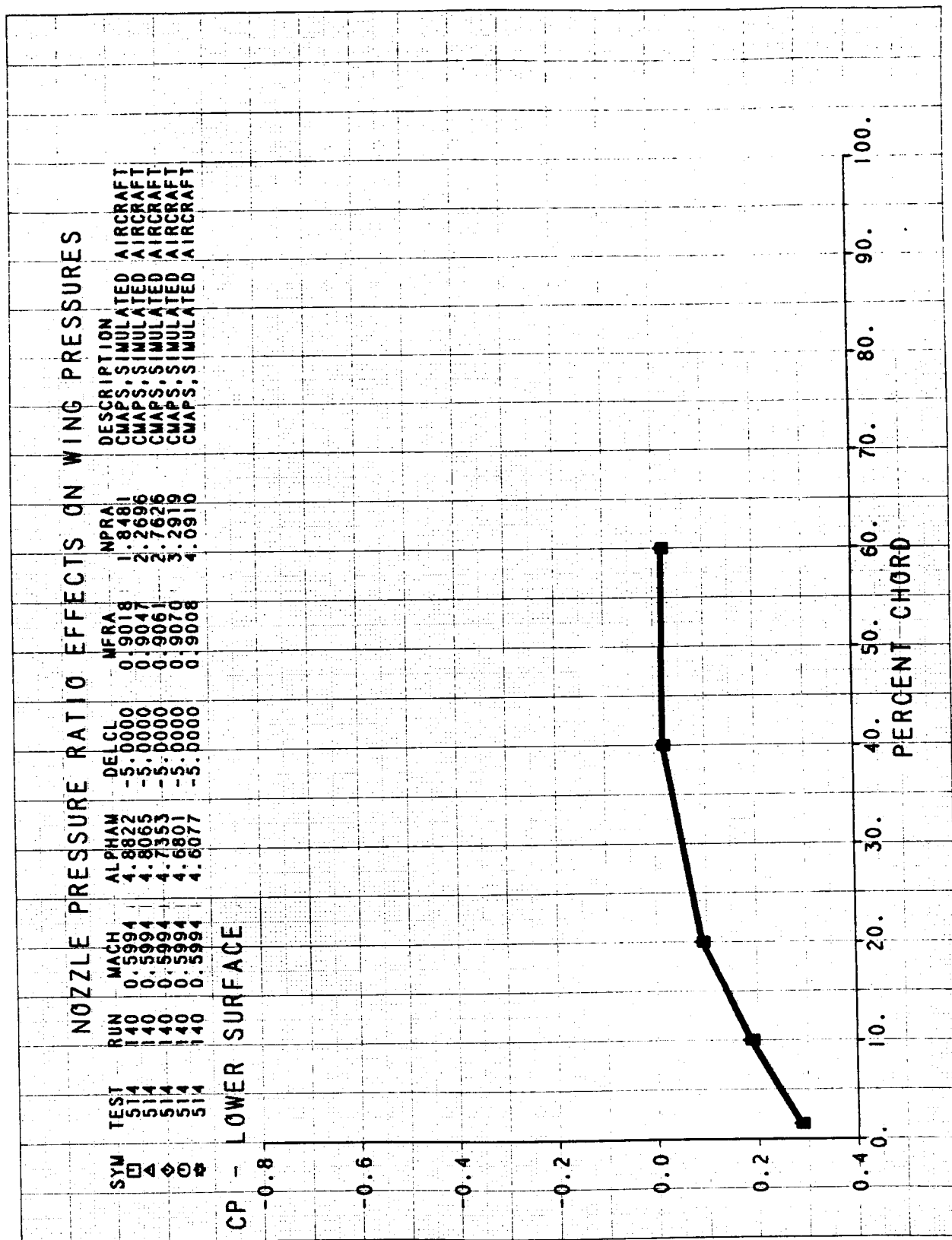


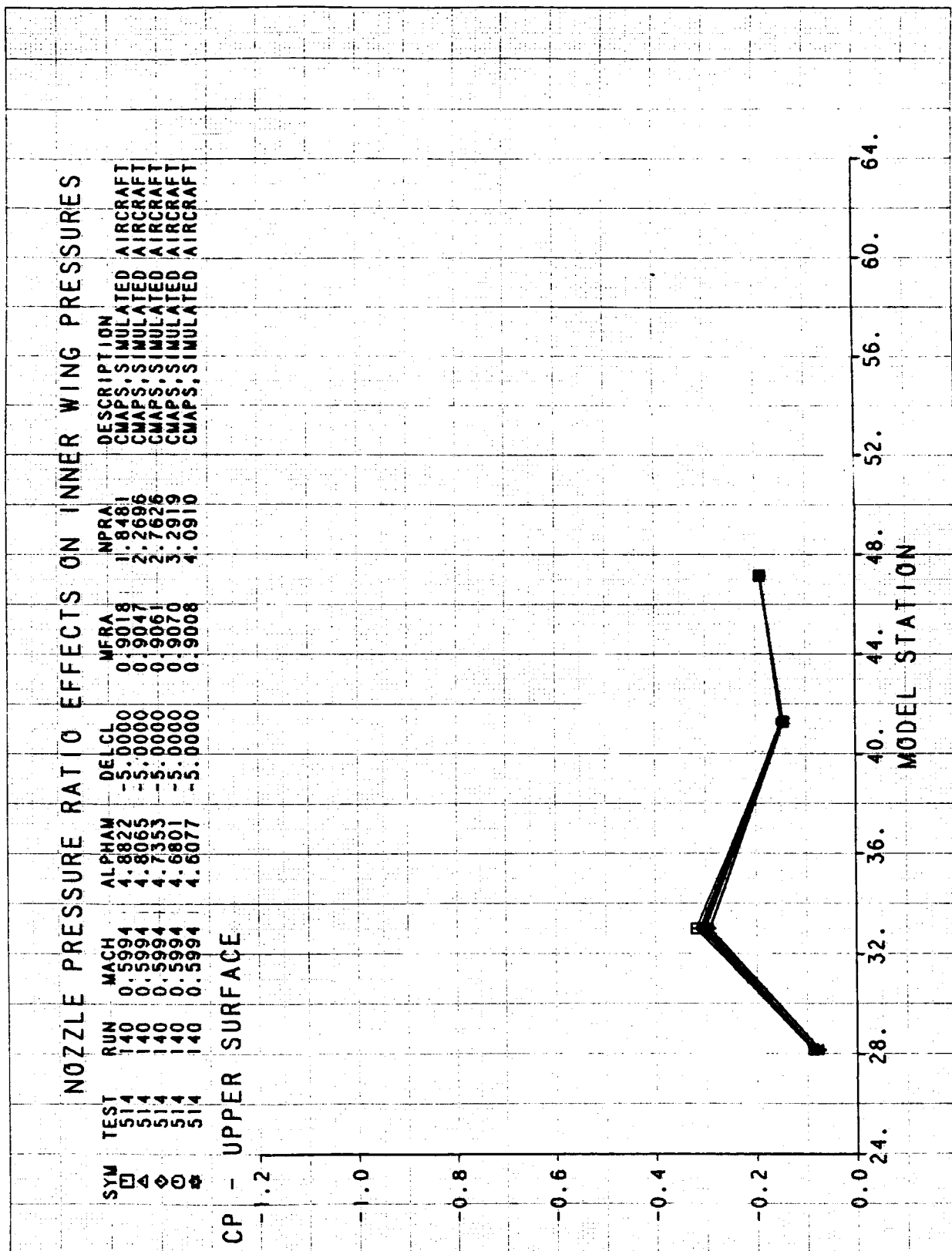


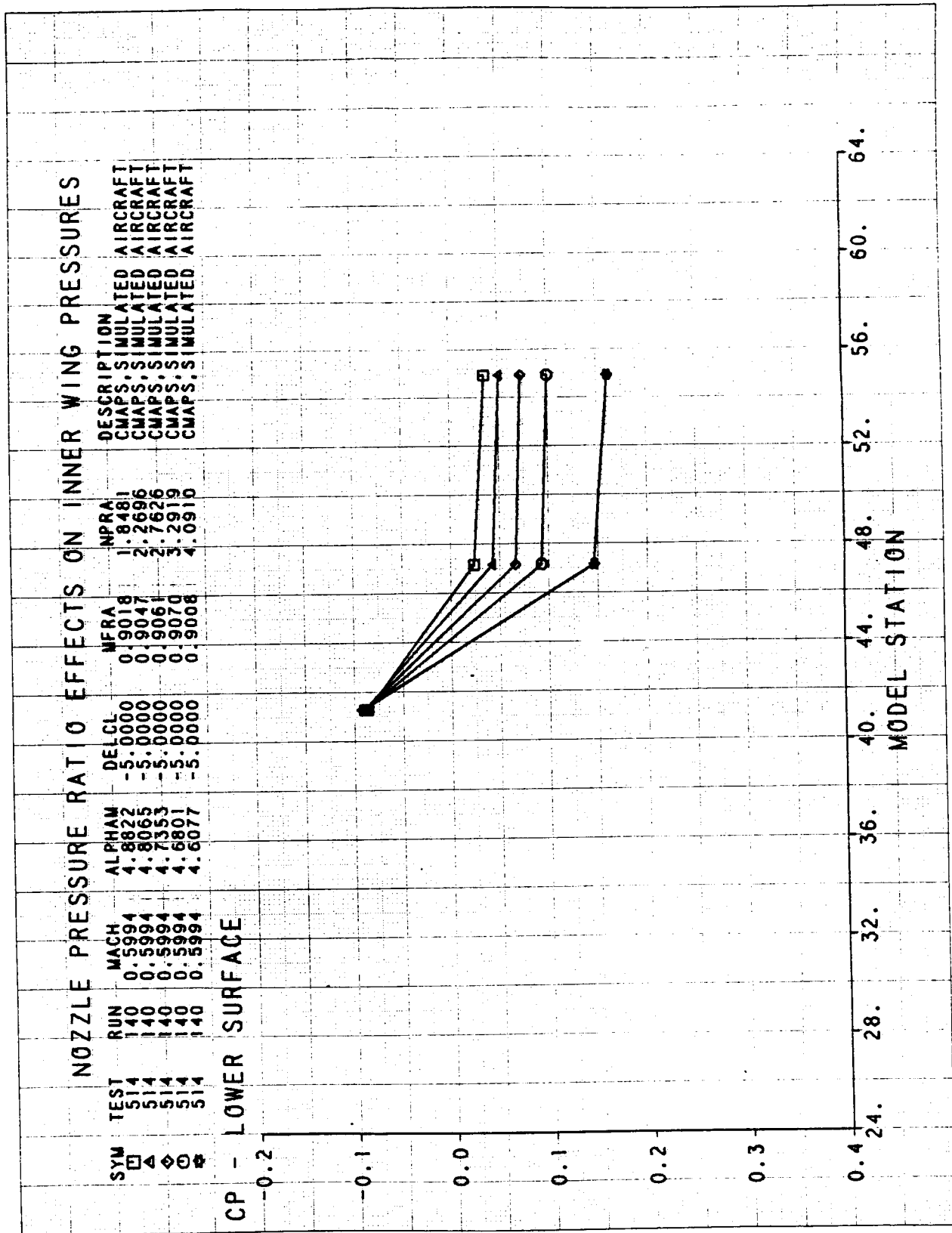


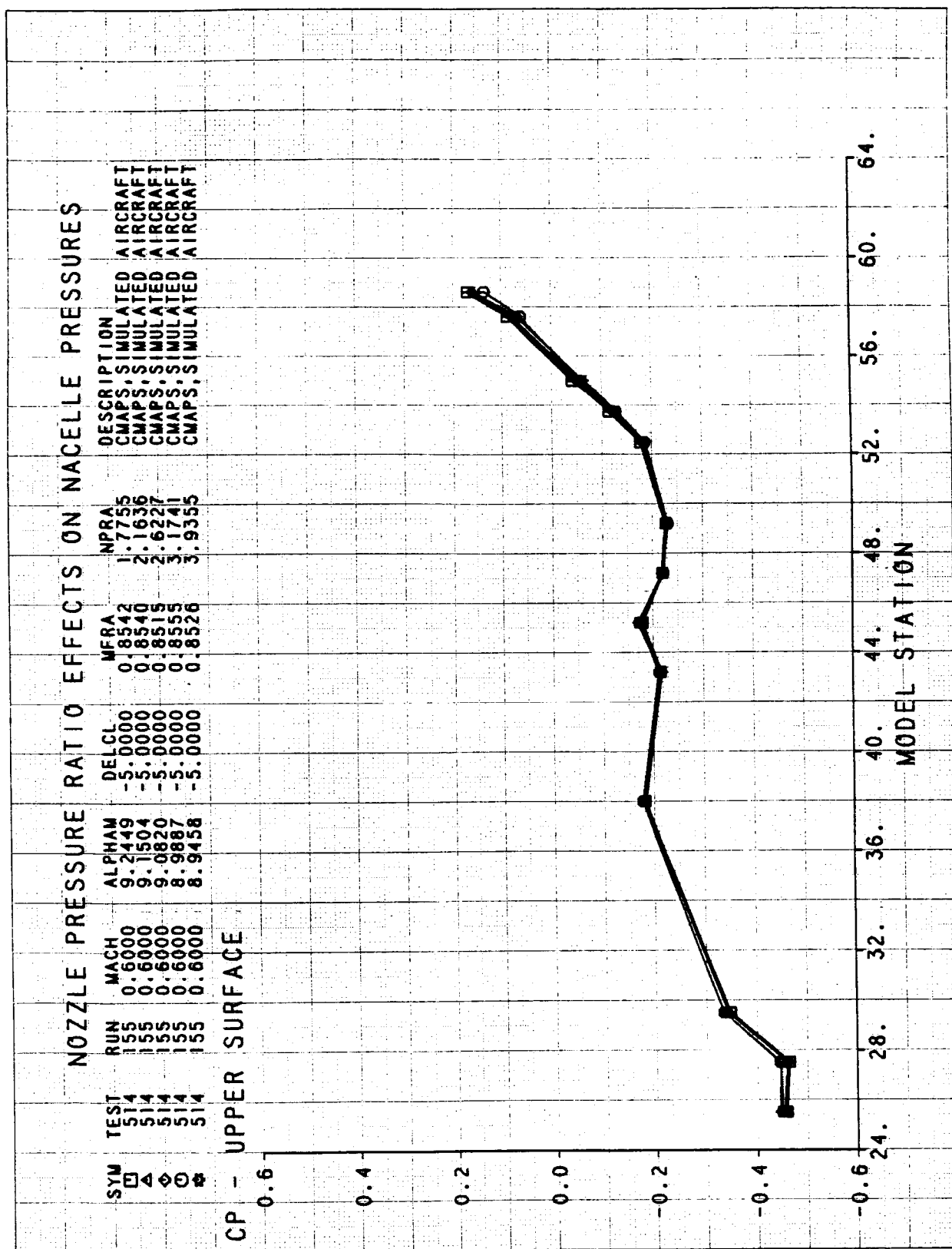


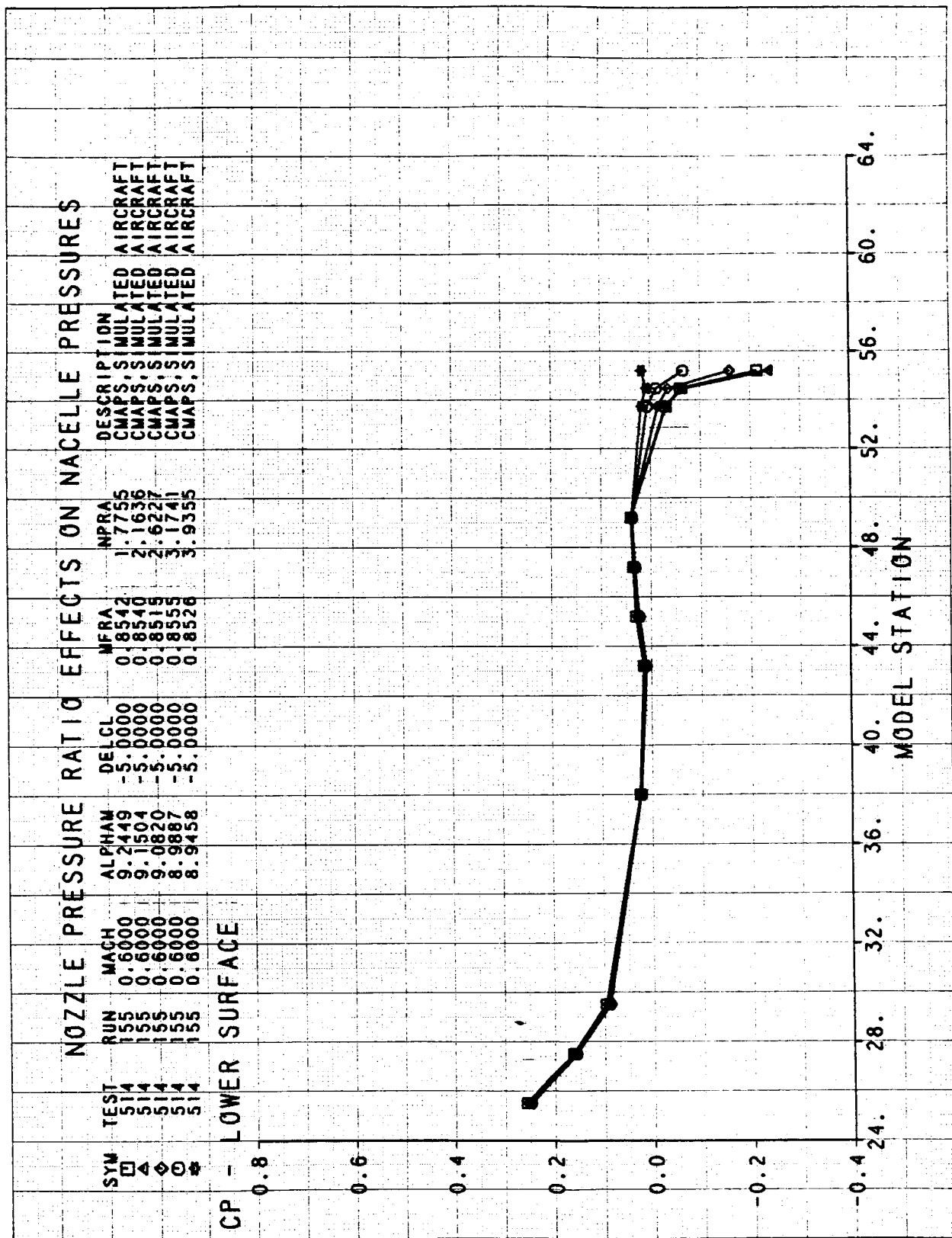


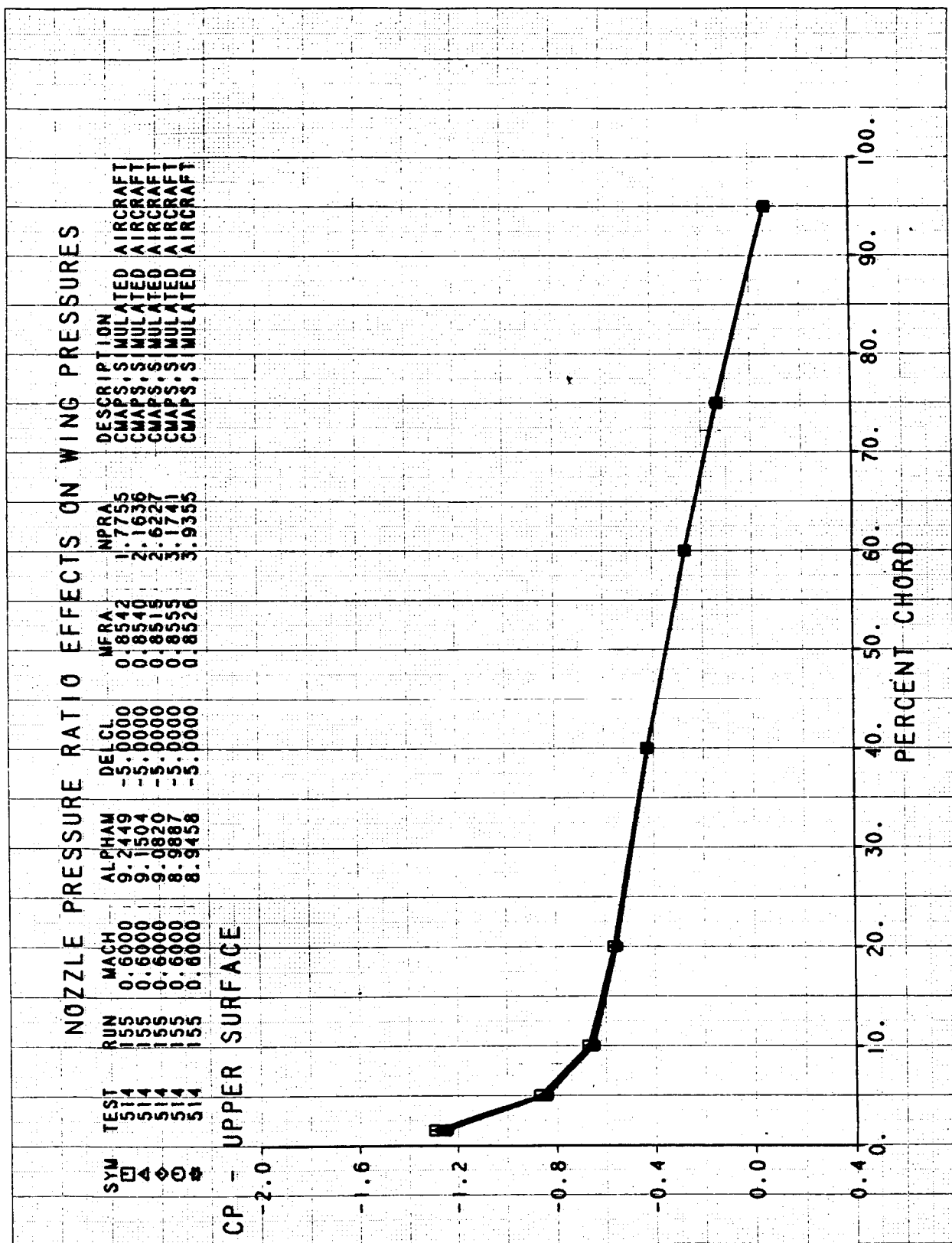




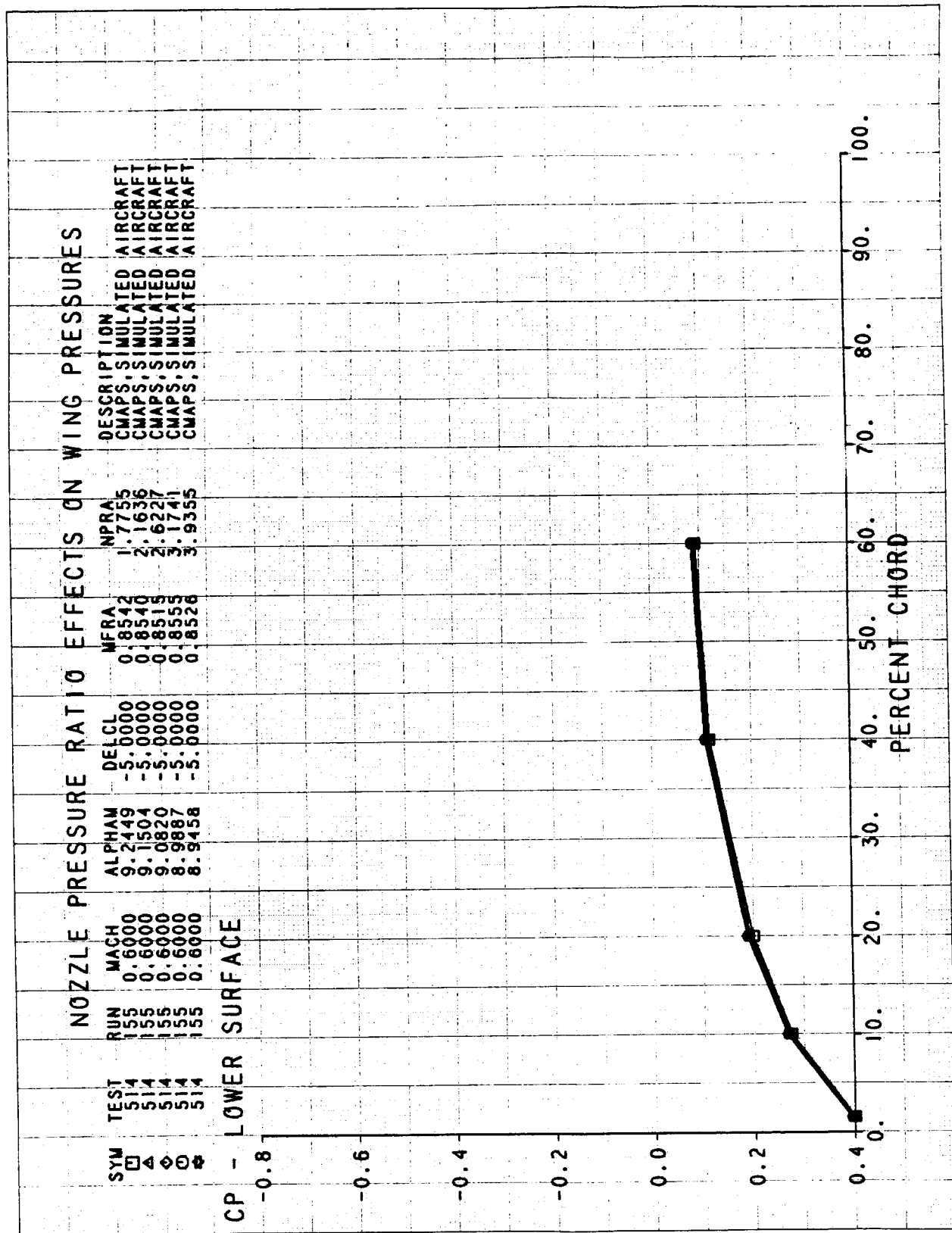


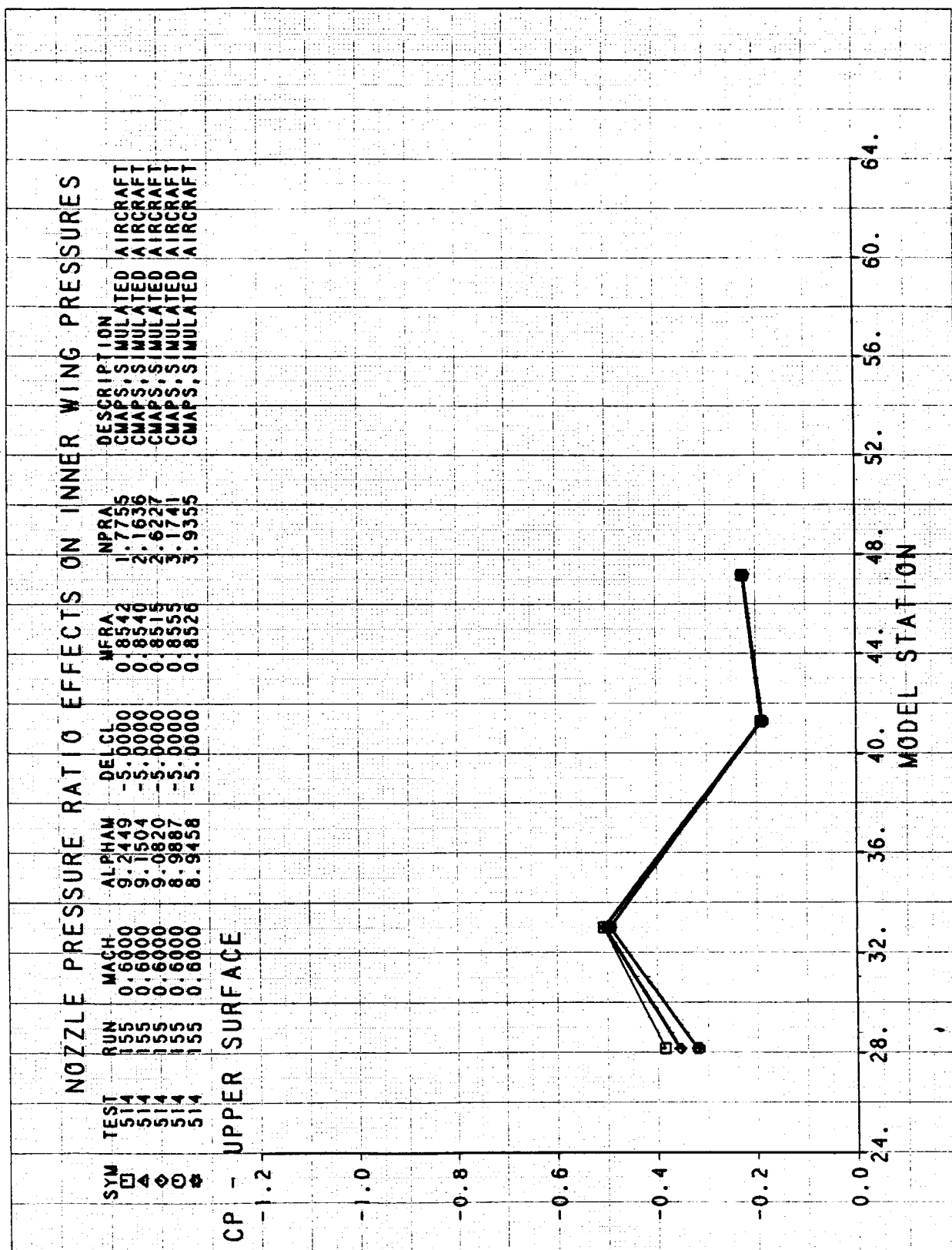


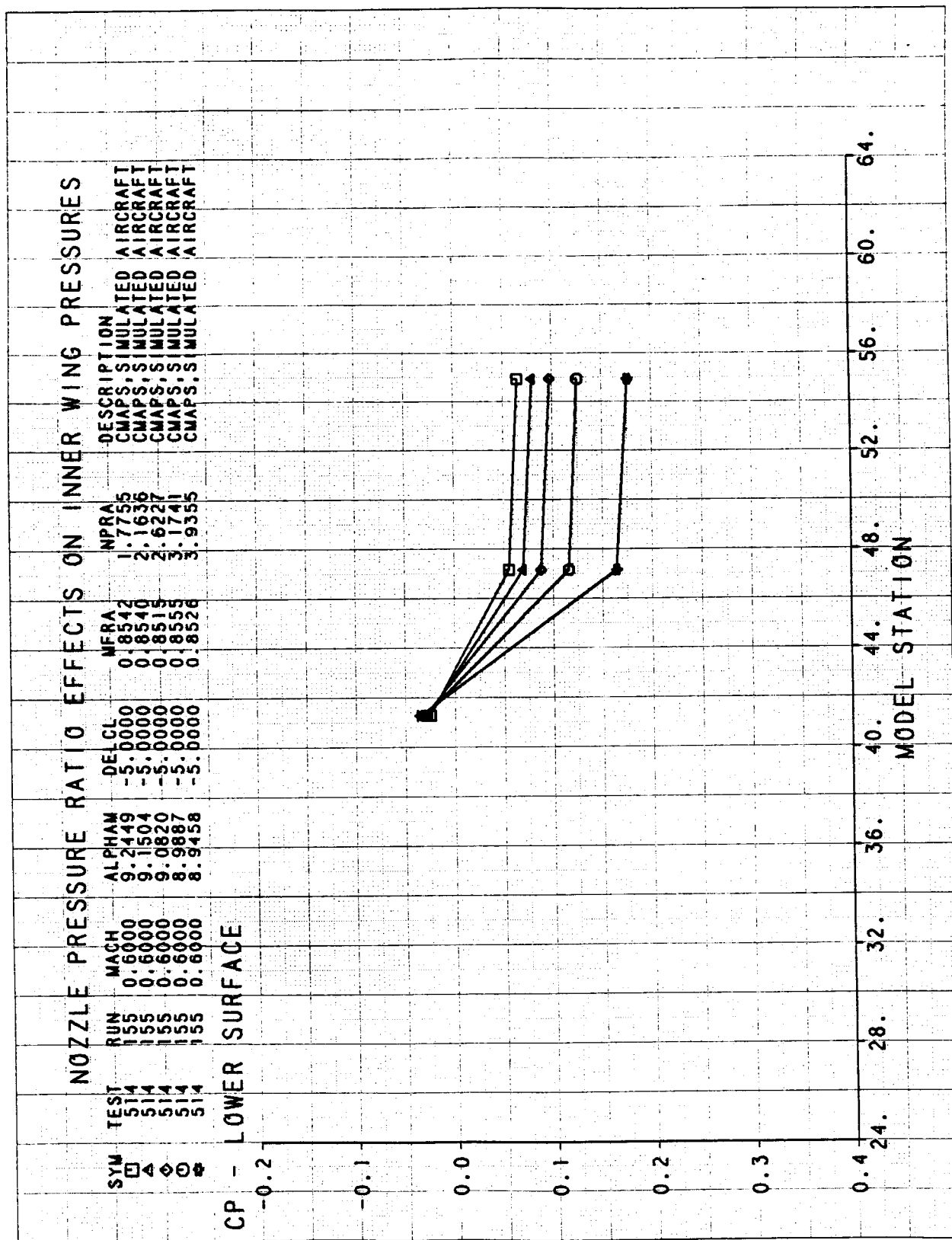


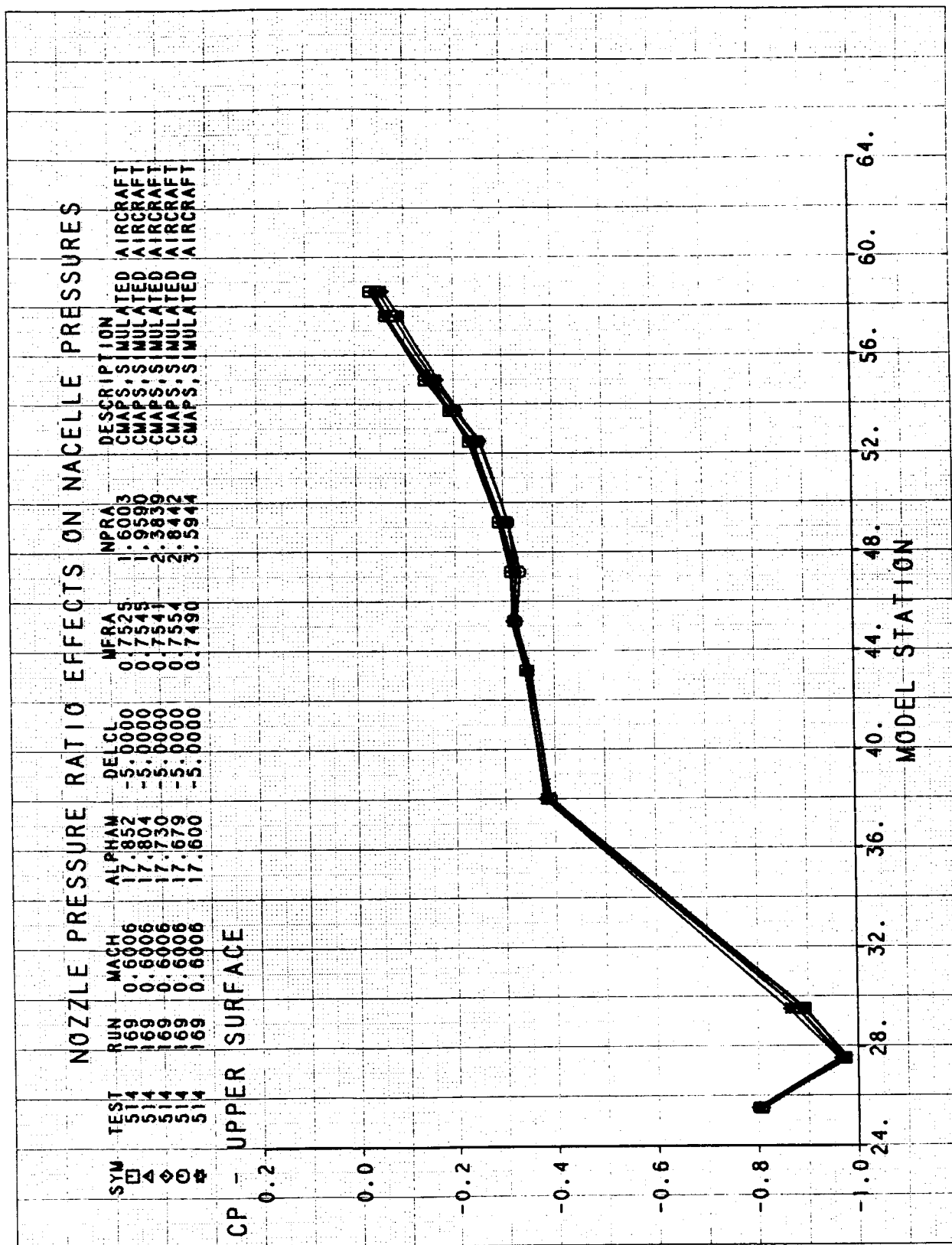


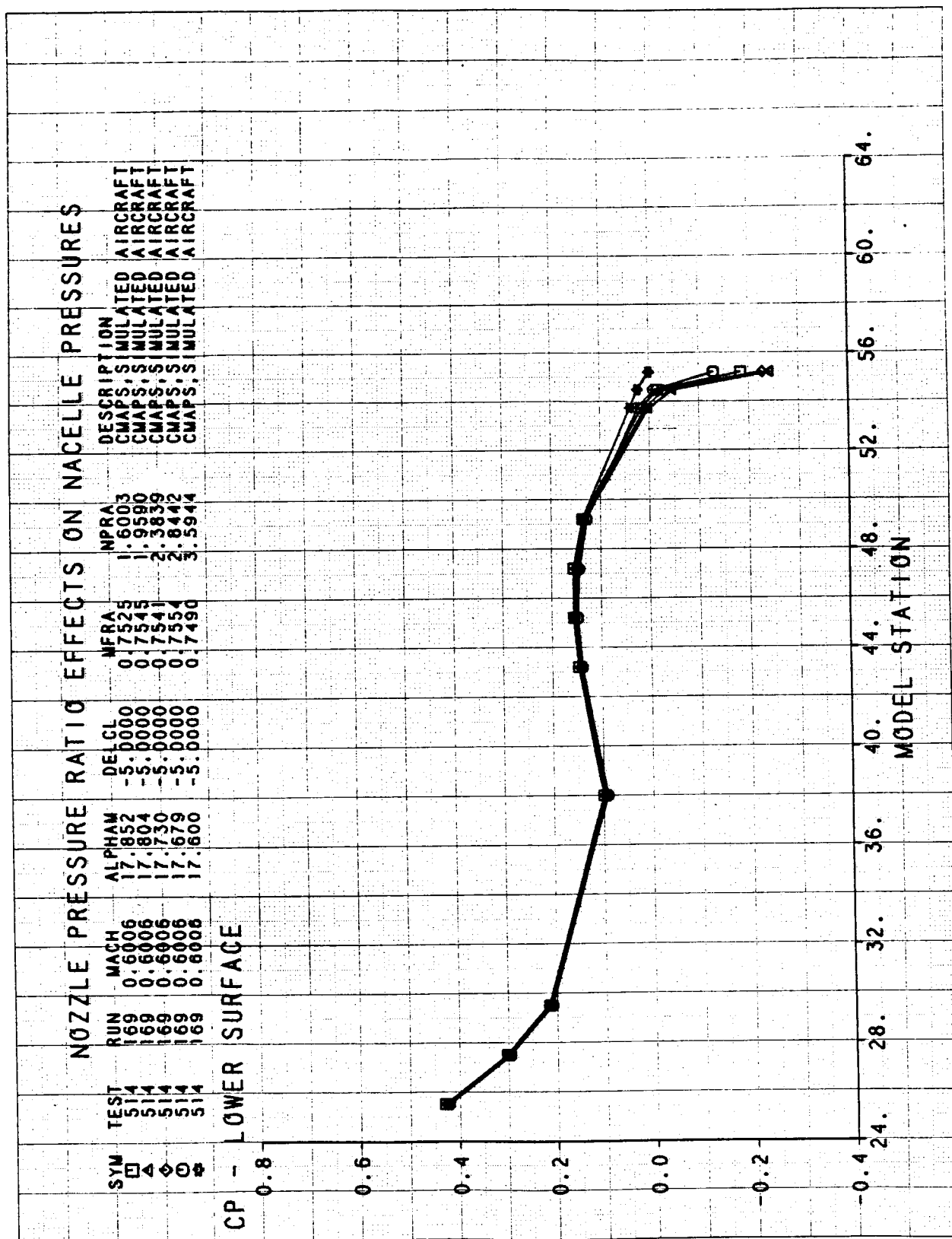


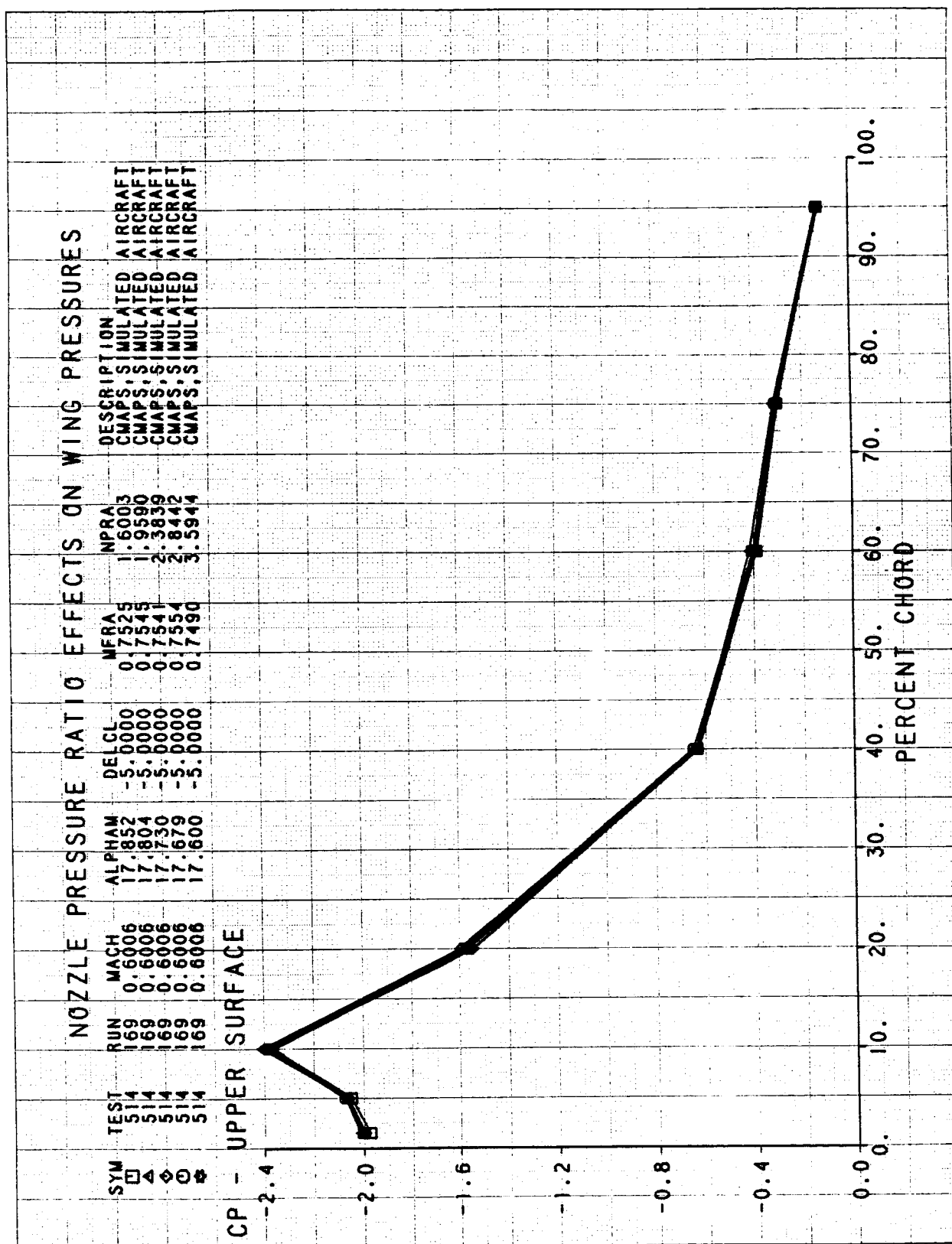


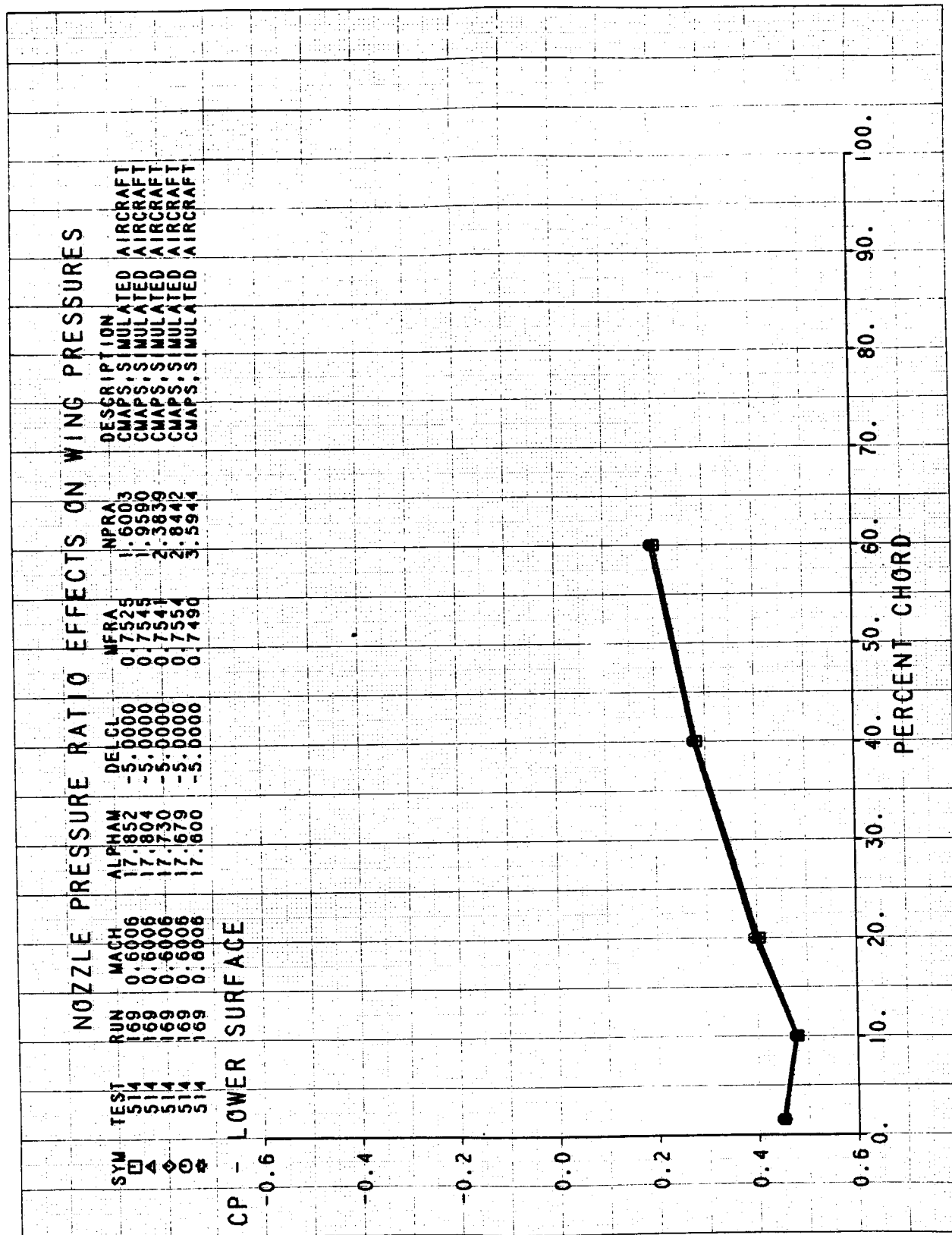


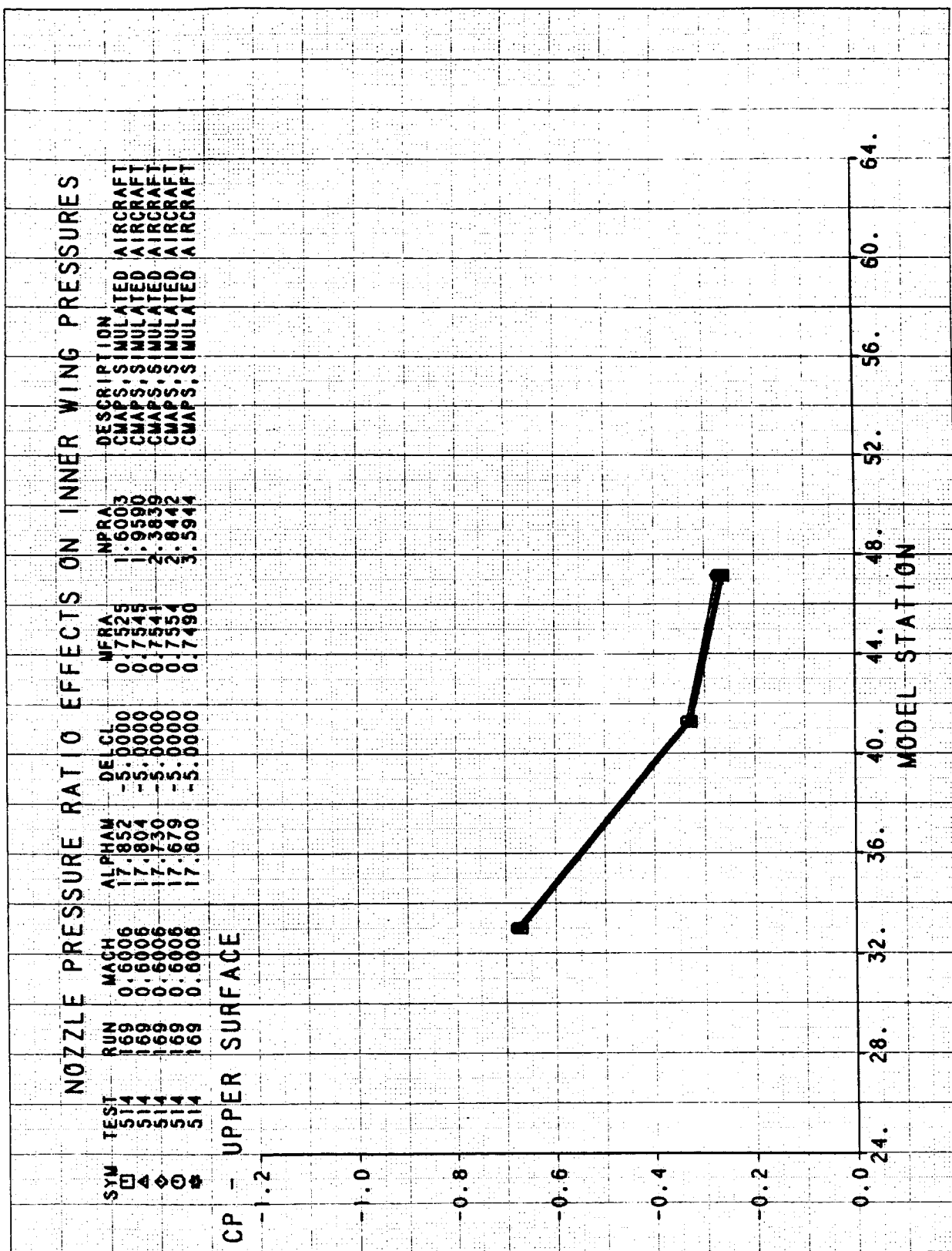




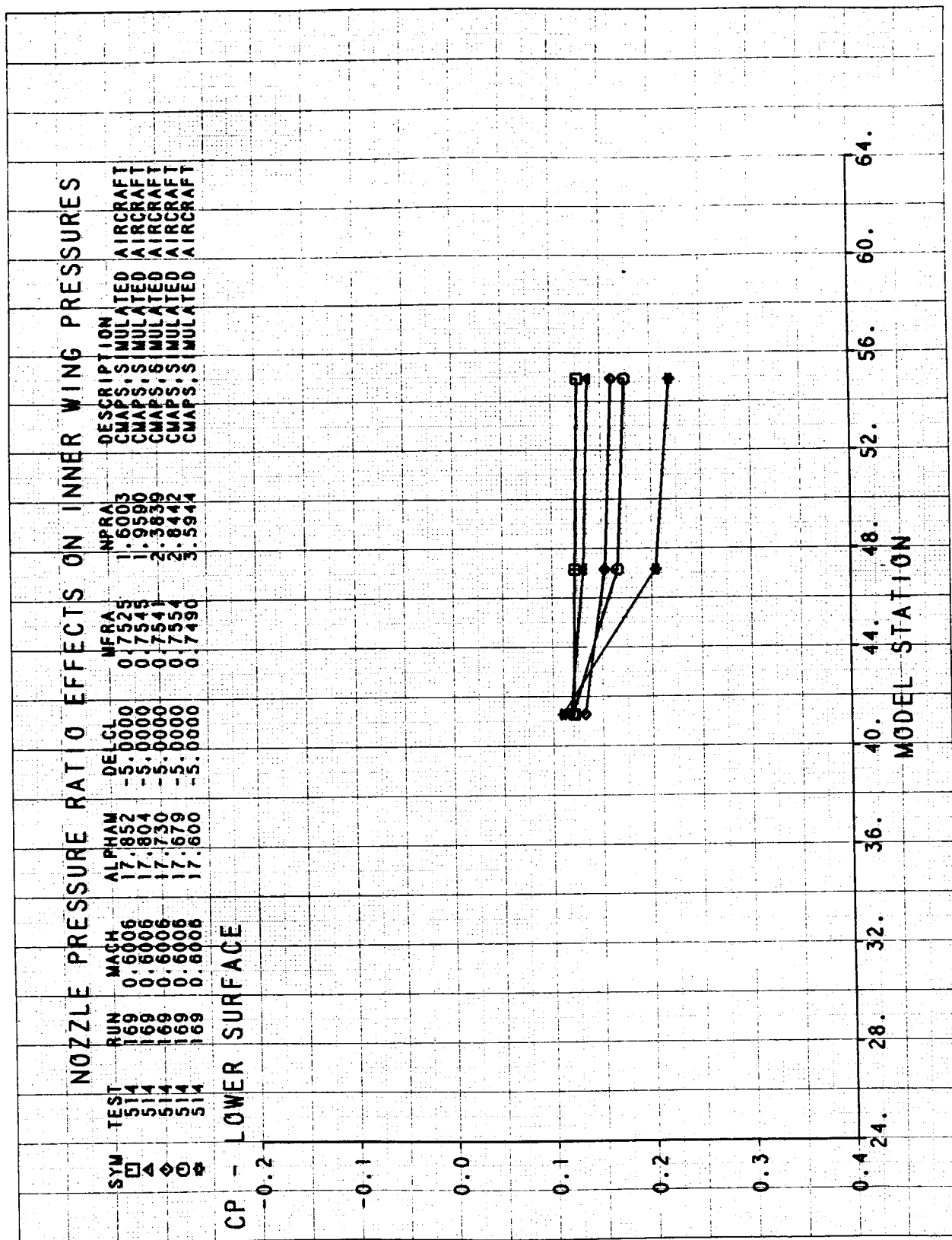








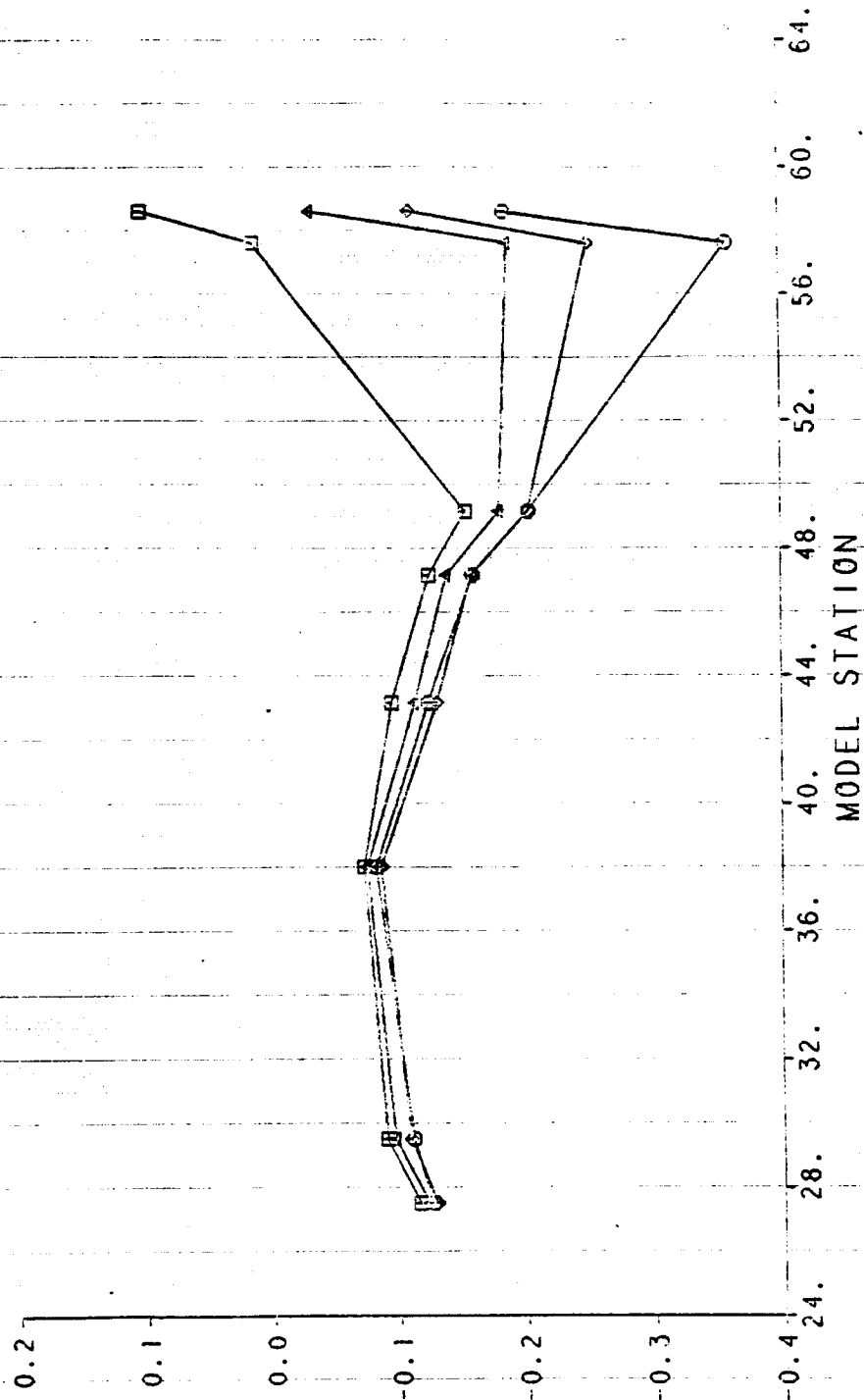


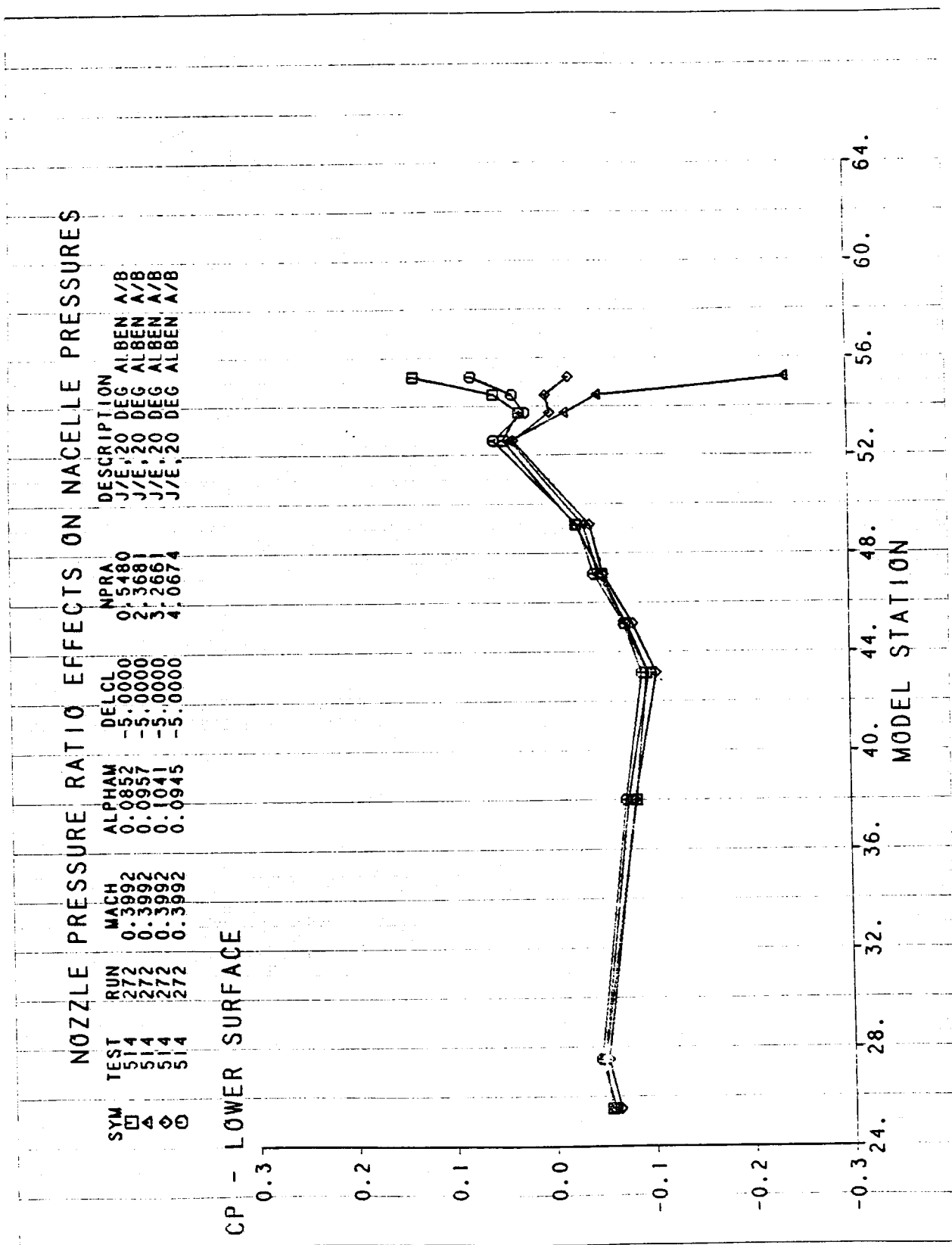


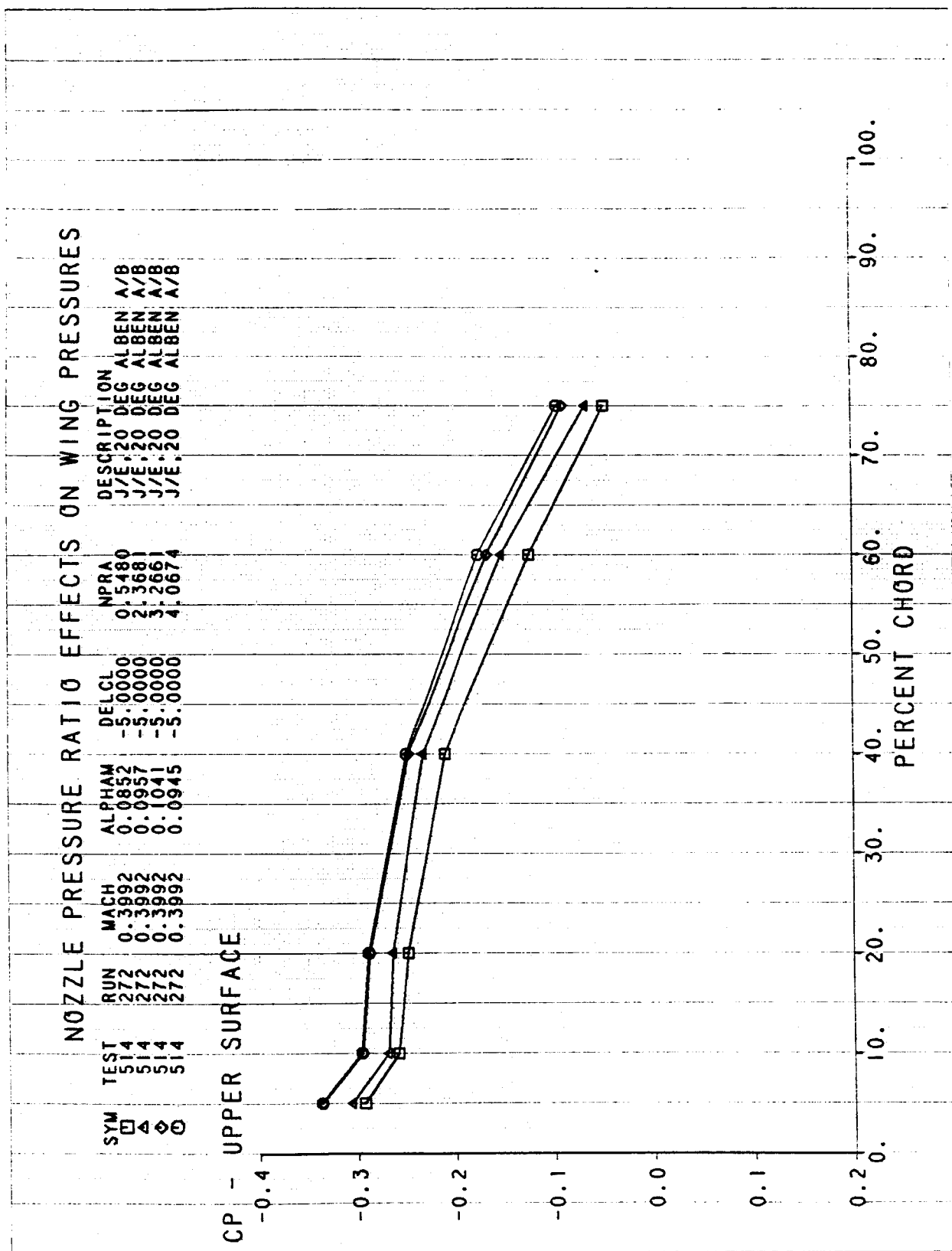
# NOZZLE PRESSURE RATIO EFFECTS ON NACELLE PRESSURES

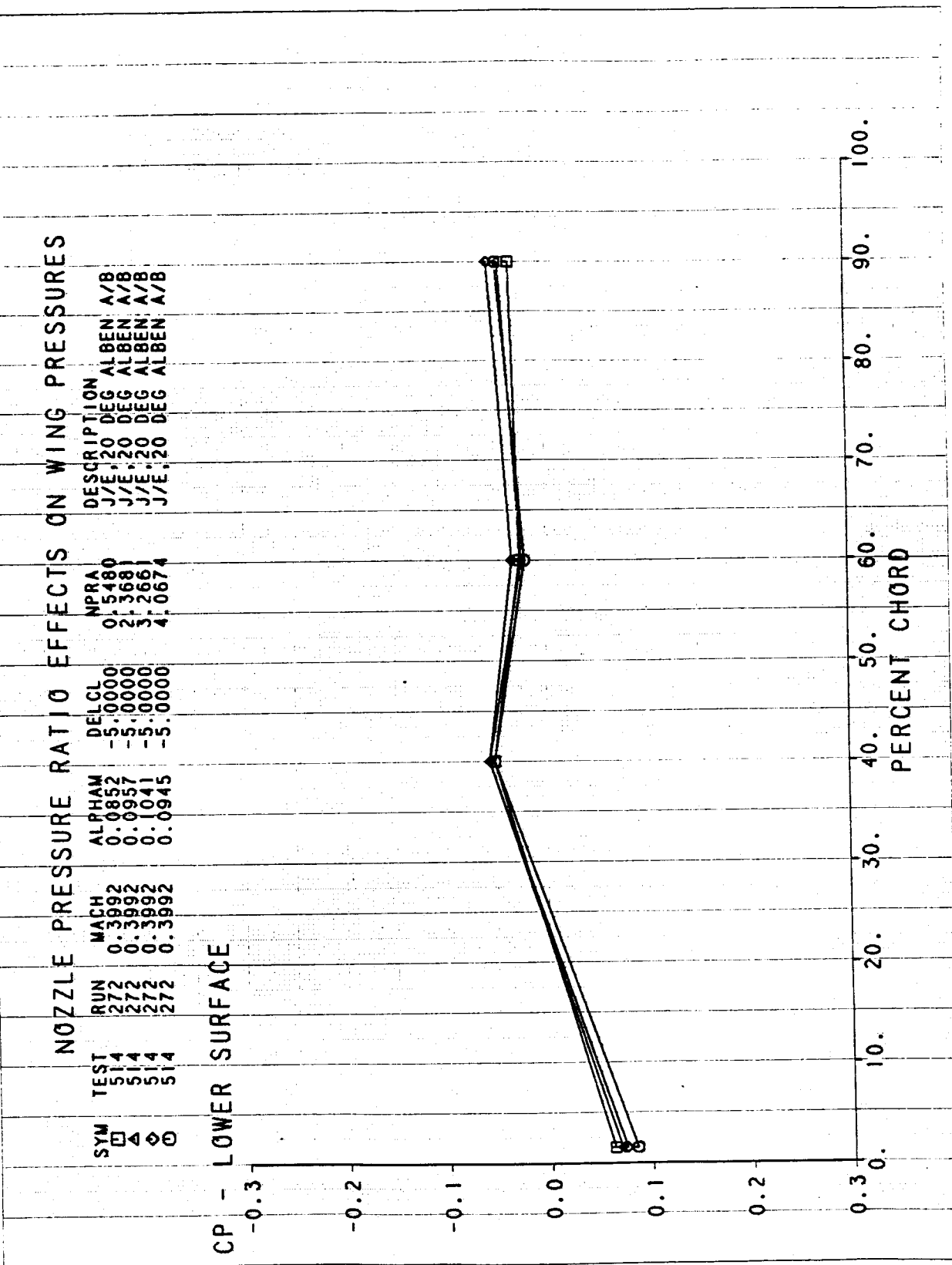
SYM	TEST	RUN	MACH	ALPHAM	DELCL	NPRA	DESCRIPTION
□	514	272	0.3992	0.0852	-5.0000	0.5180	J/E, 20 DEG ALBEN A/B
△	514	272	0.3992	0.0957	-5.0000	2.3081	J/E, 20 DEG ALBEN A/B
◇	514	272	0.3992	0.1041	-5.0000	3.2661	J/E, 20 DEG ALBEN A/B
○	514	272	0.3992	0.0945	-5.0000	4.0674	J/L, 20 DEG ALBEN A/B

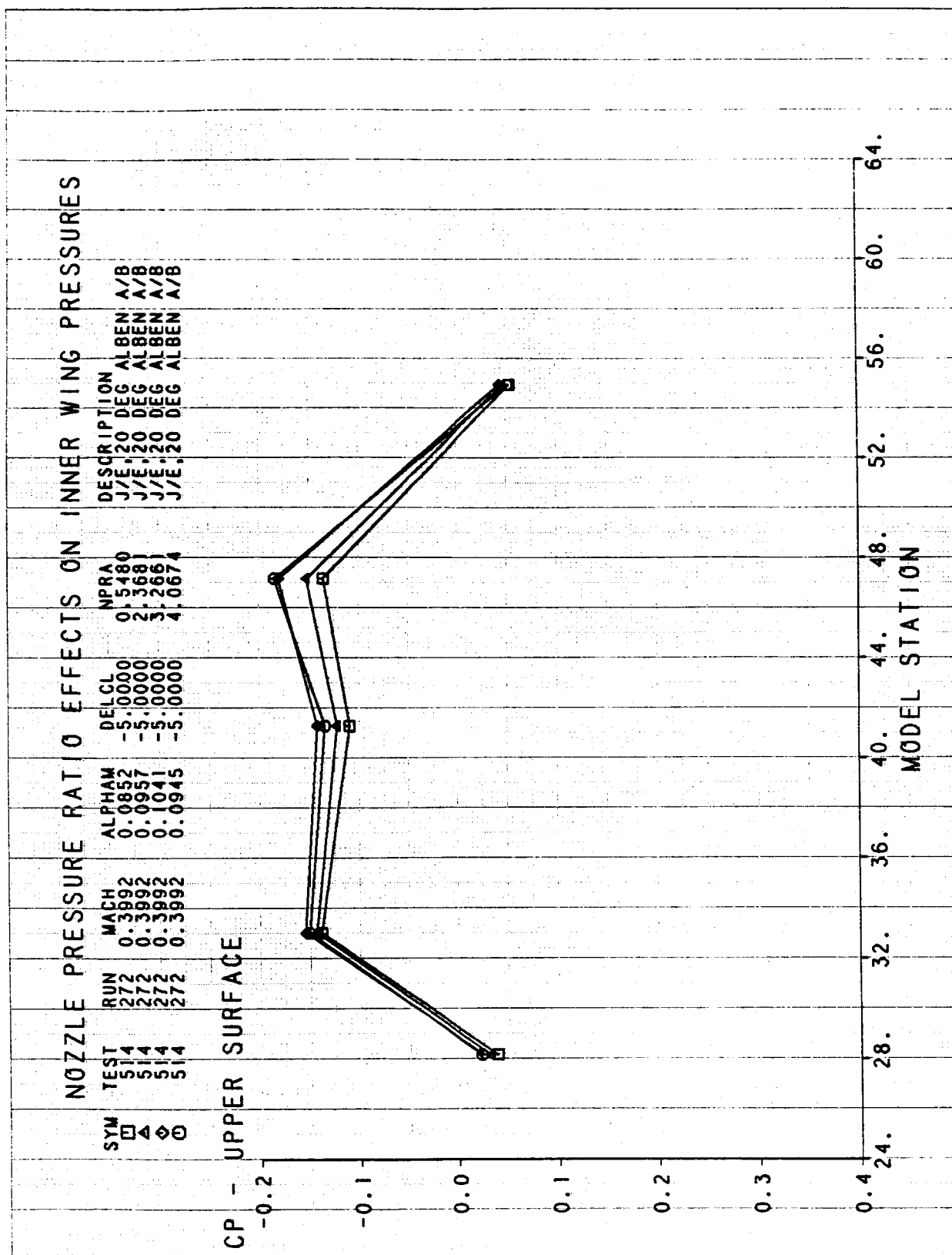
CP - UPPER SURFACE

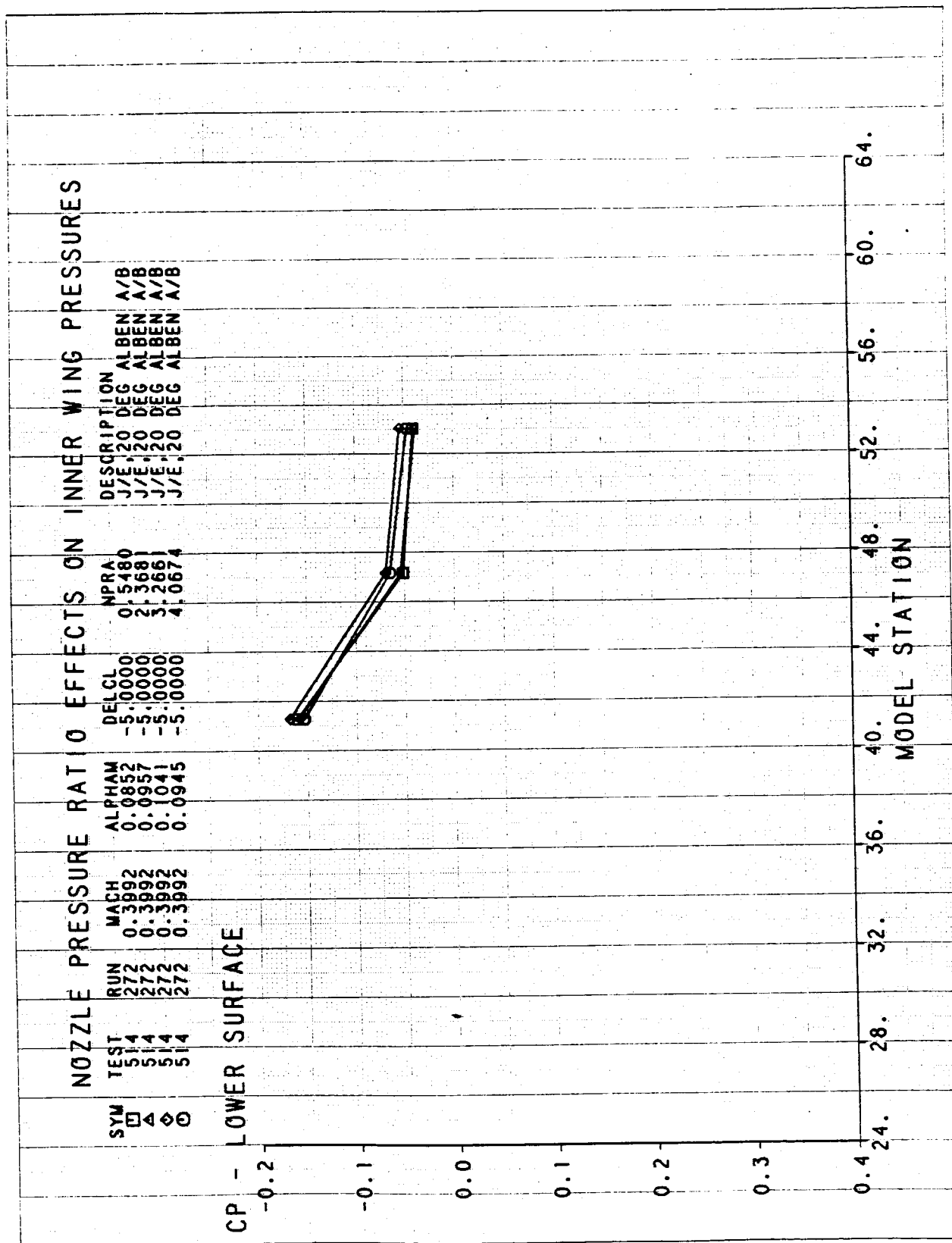


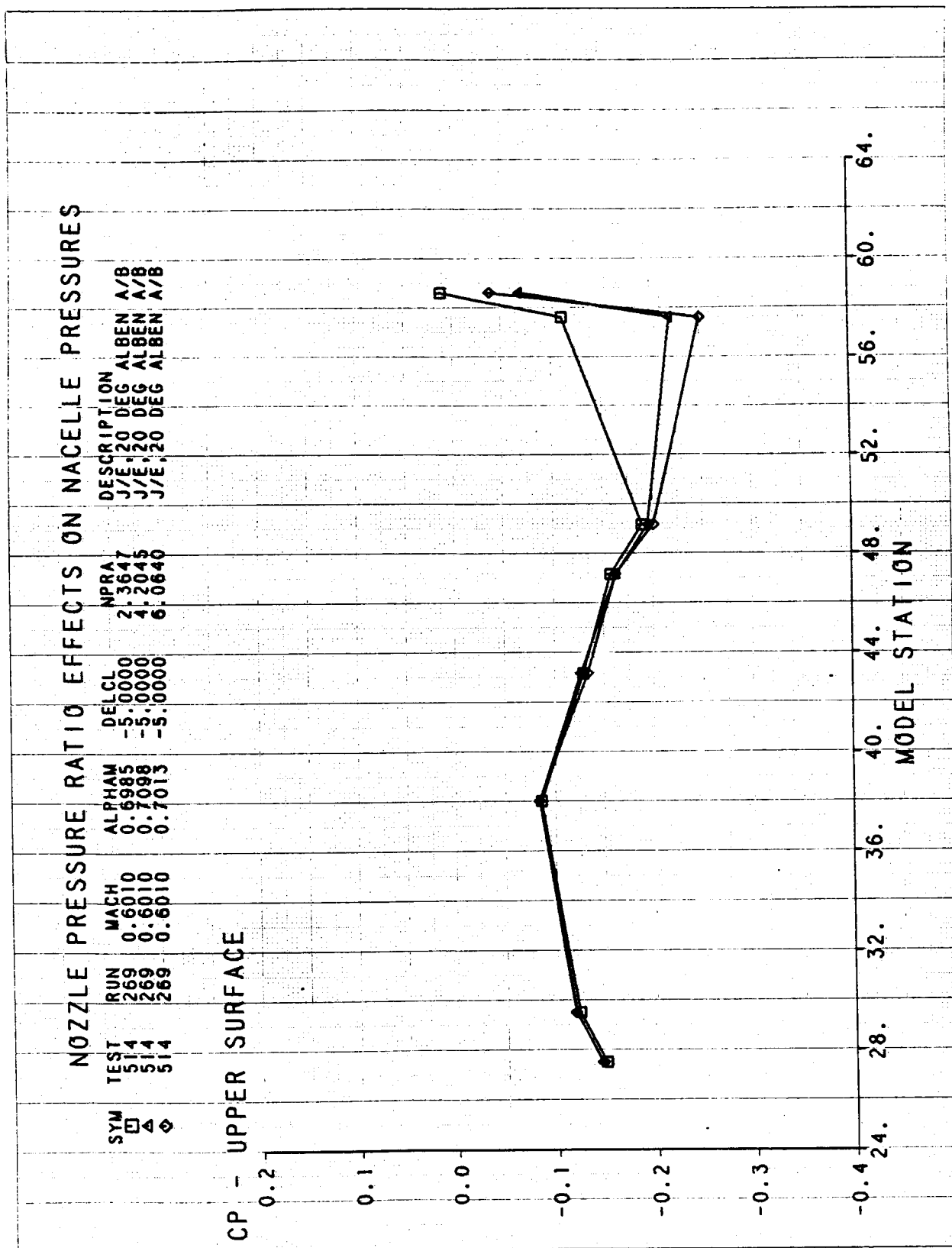




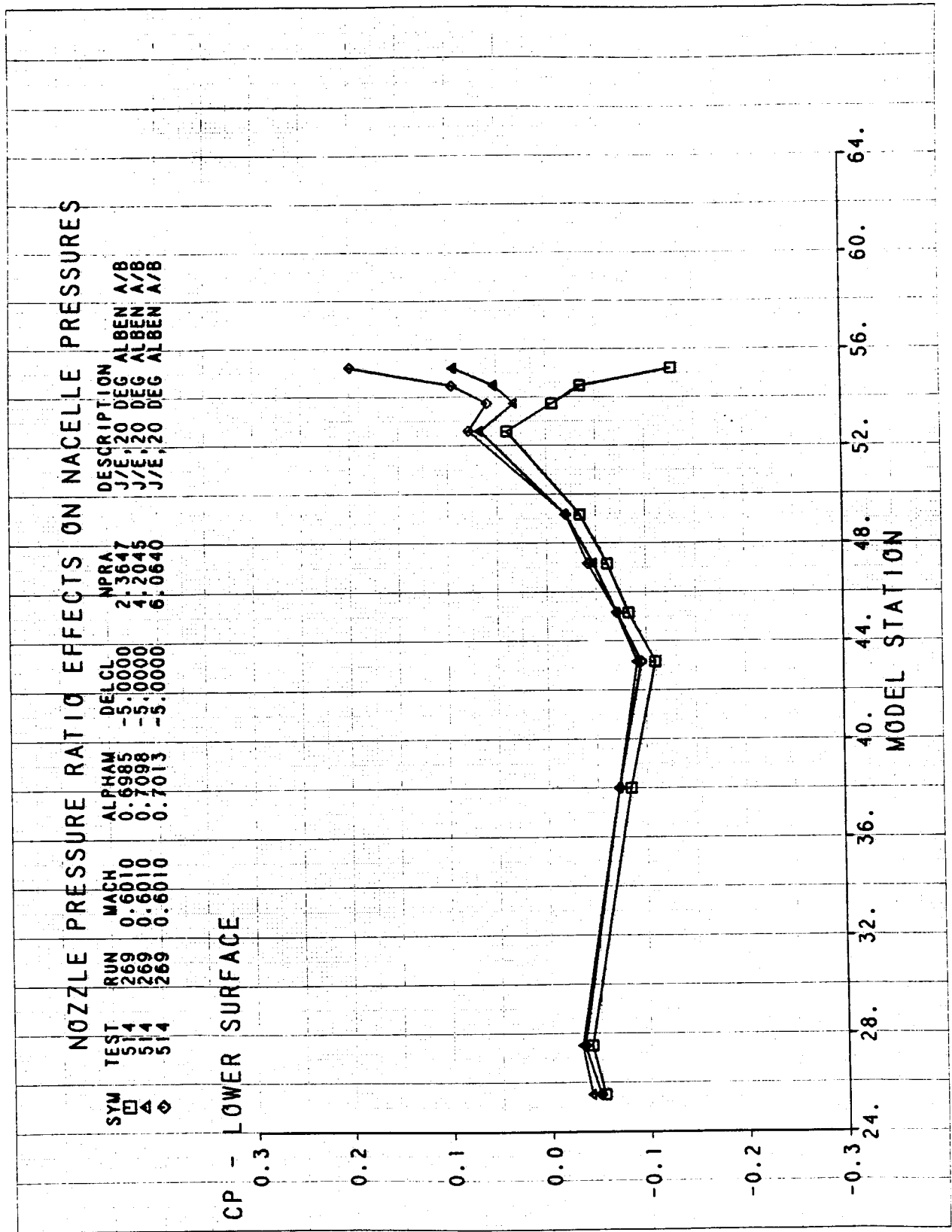


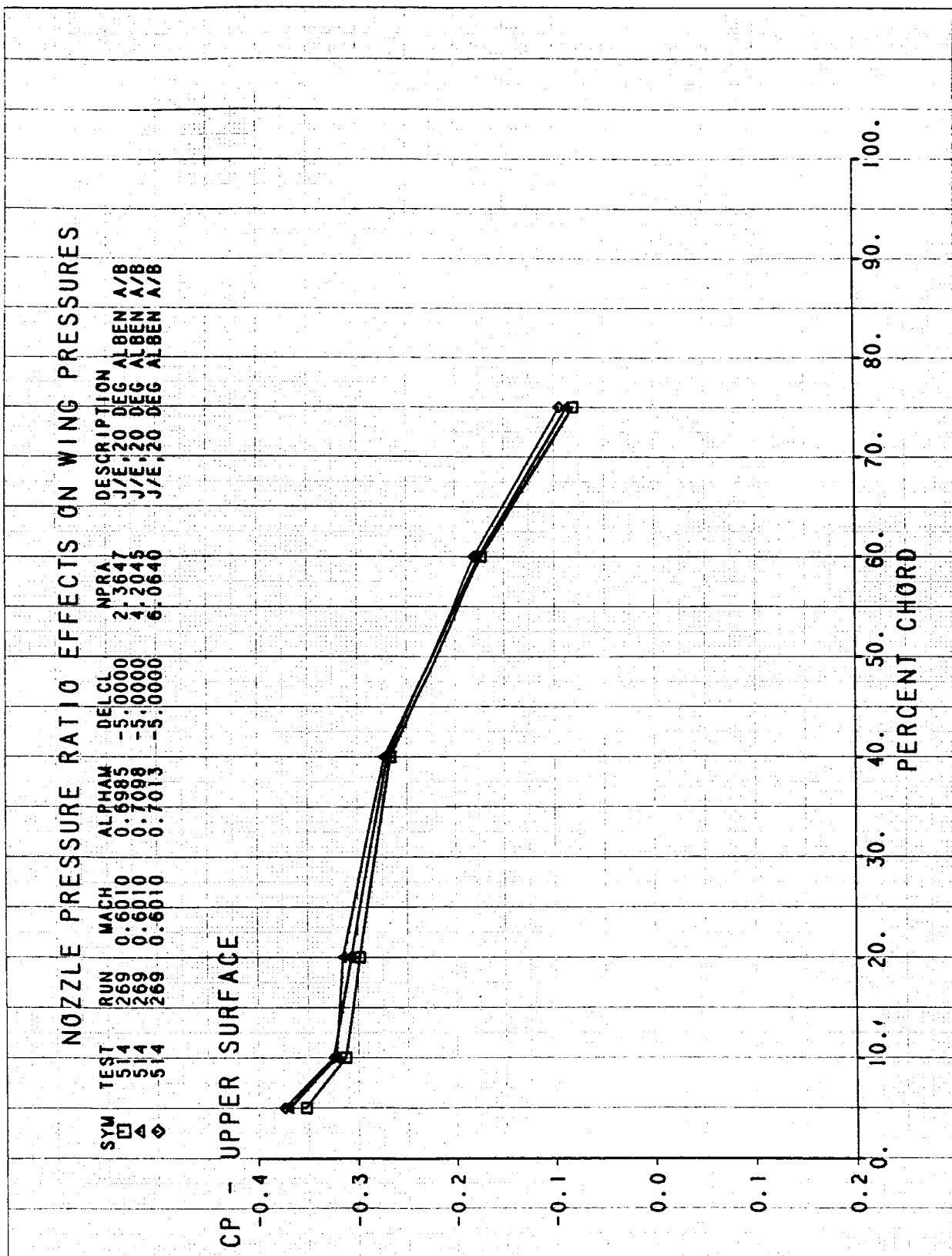


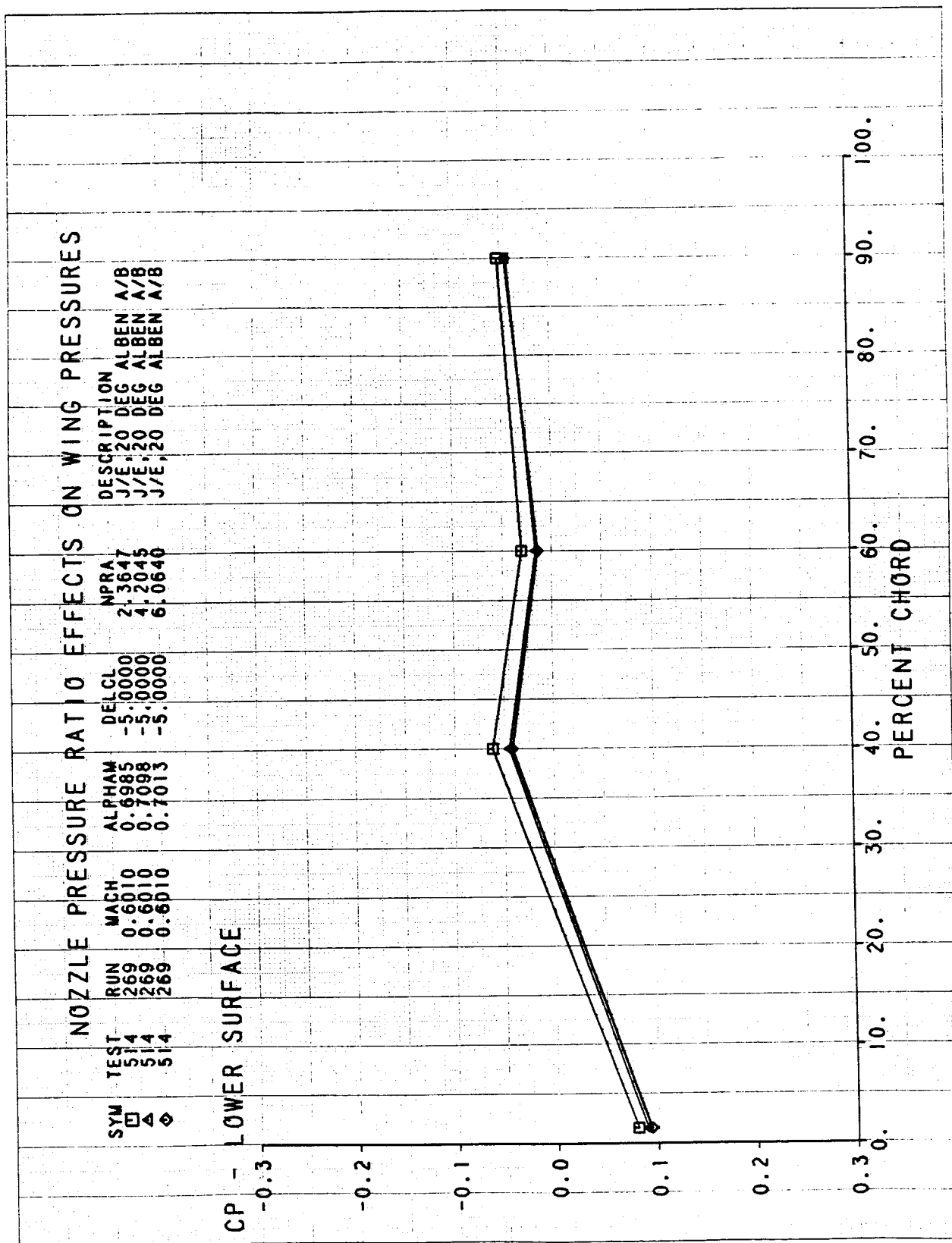


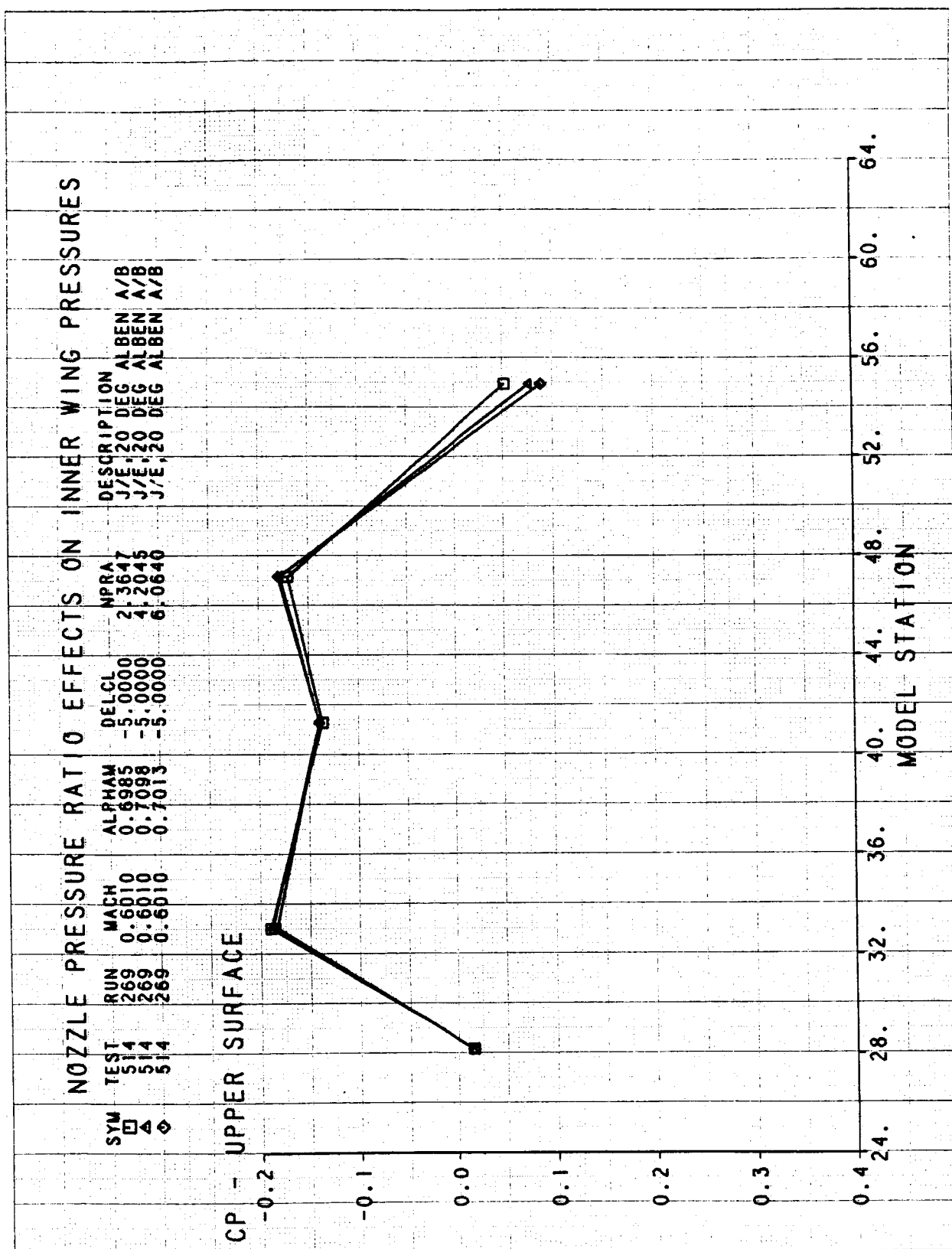


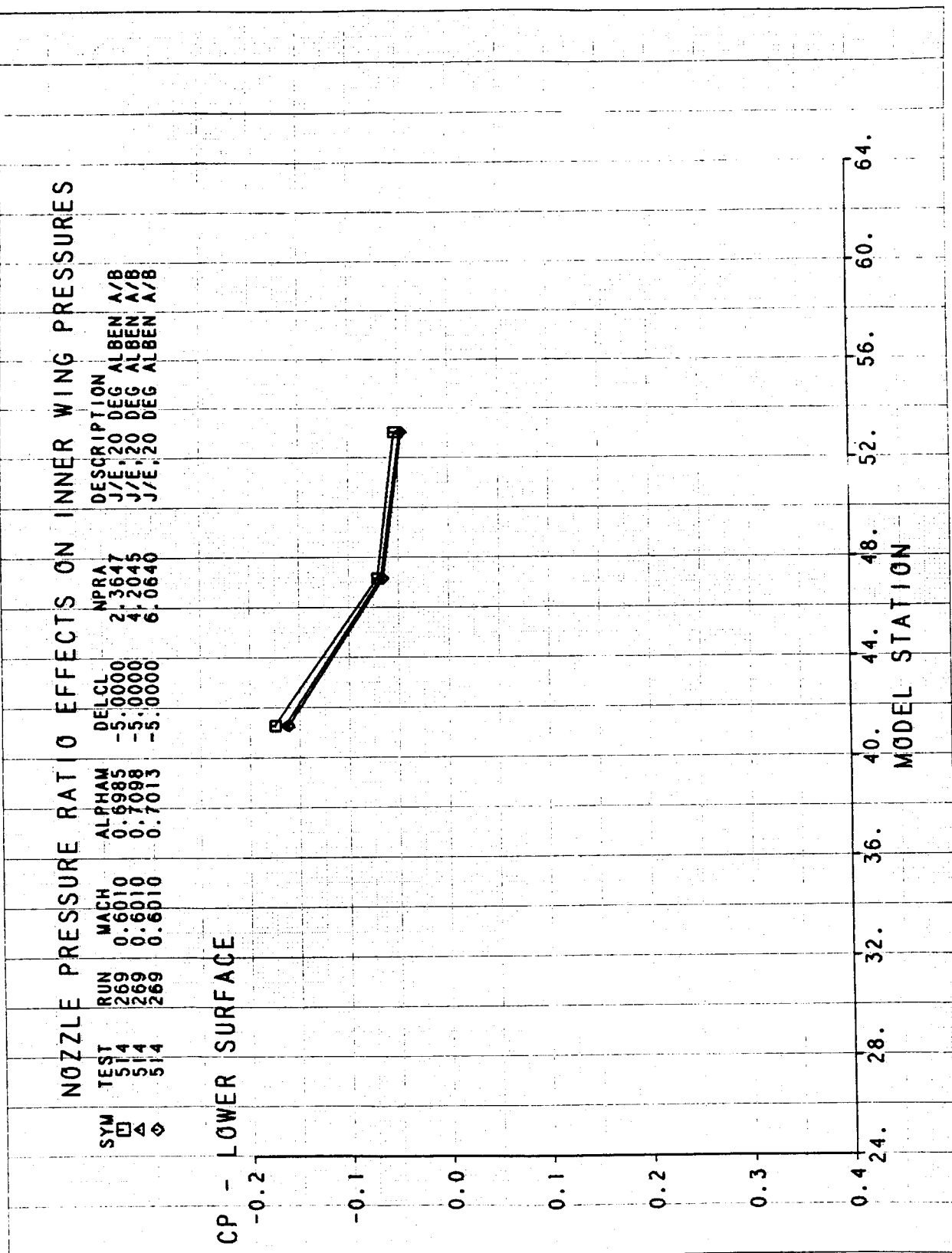


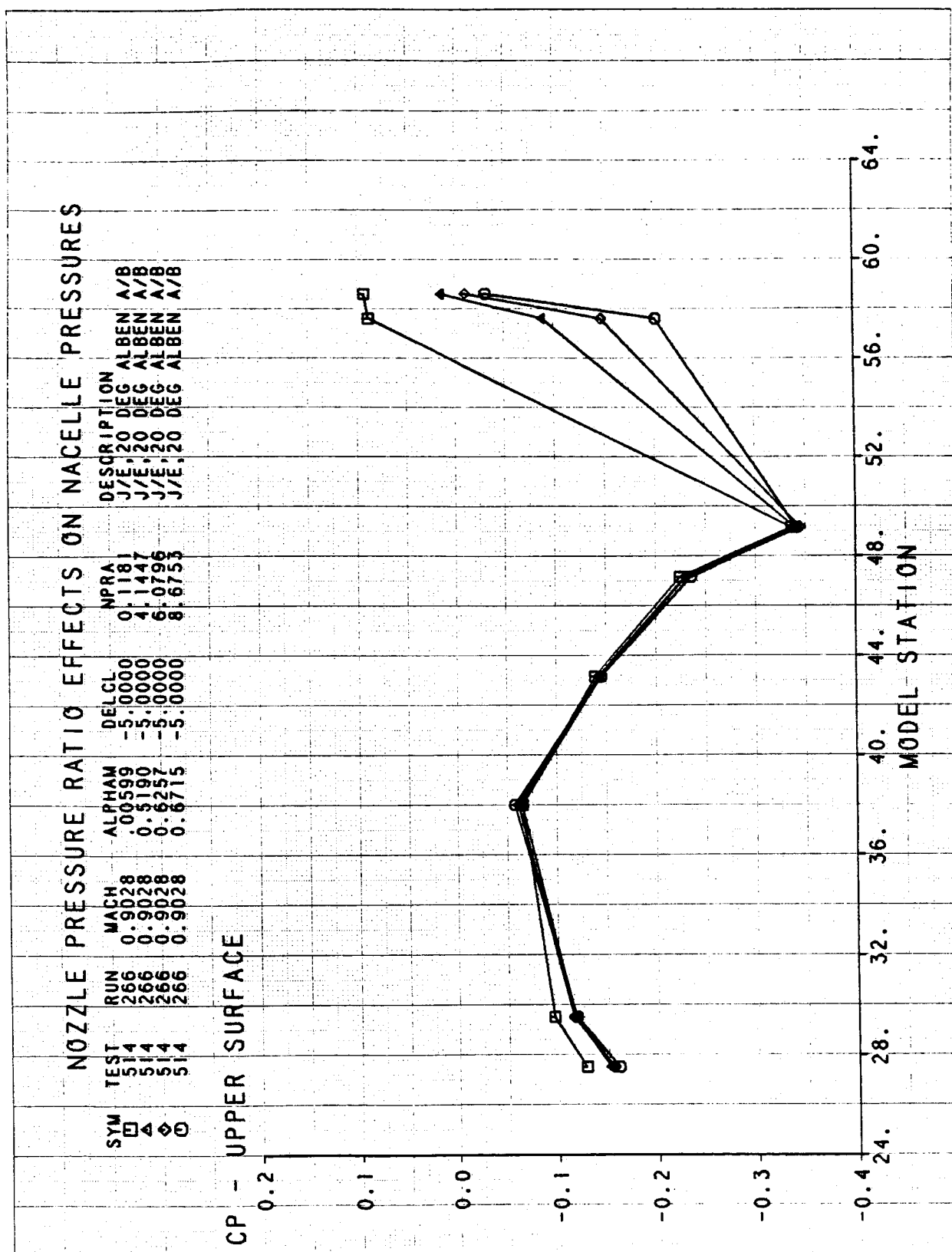


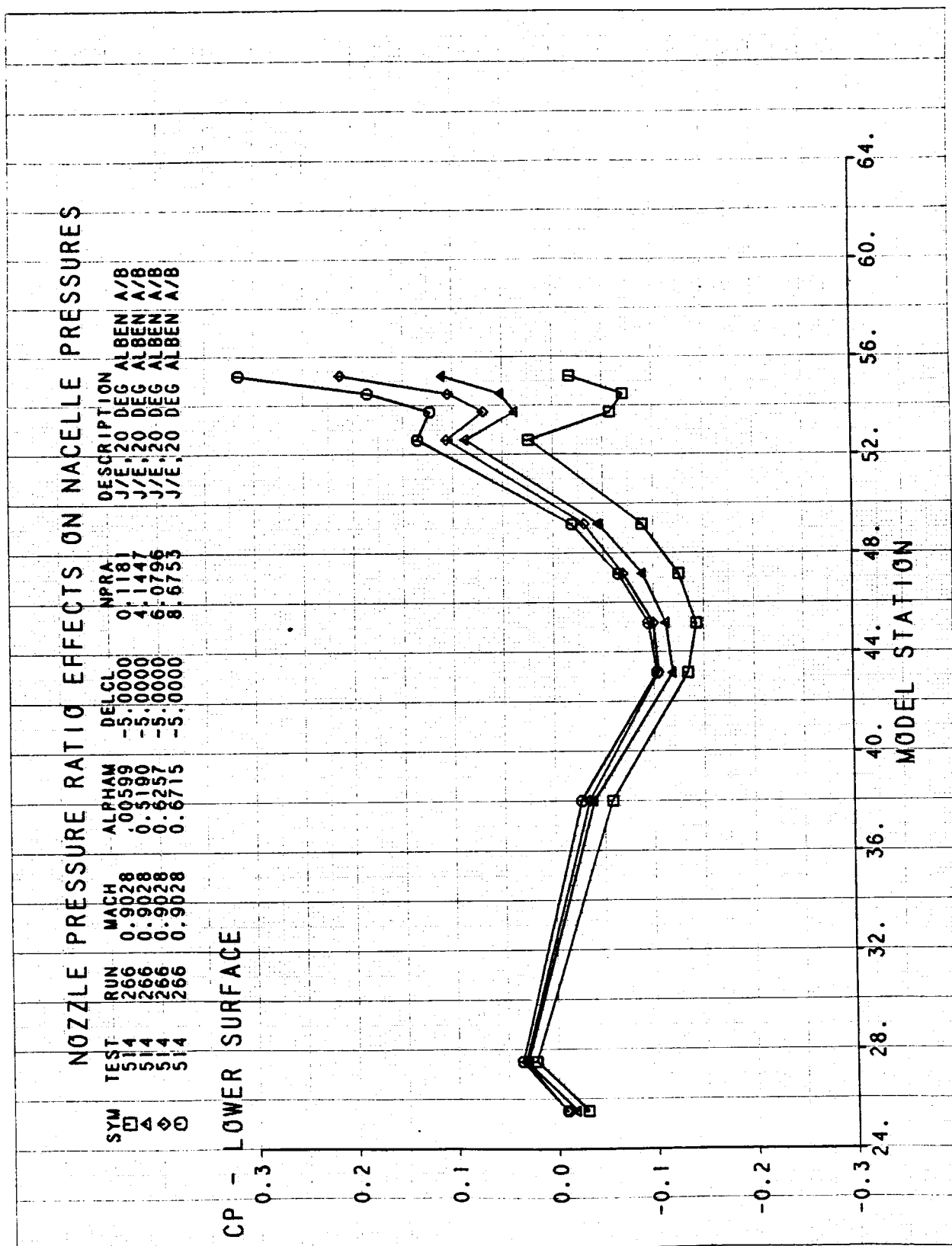


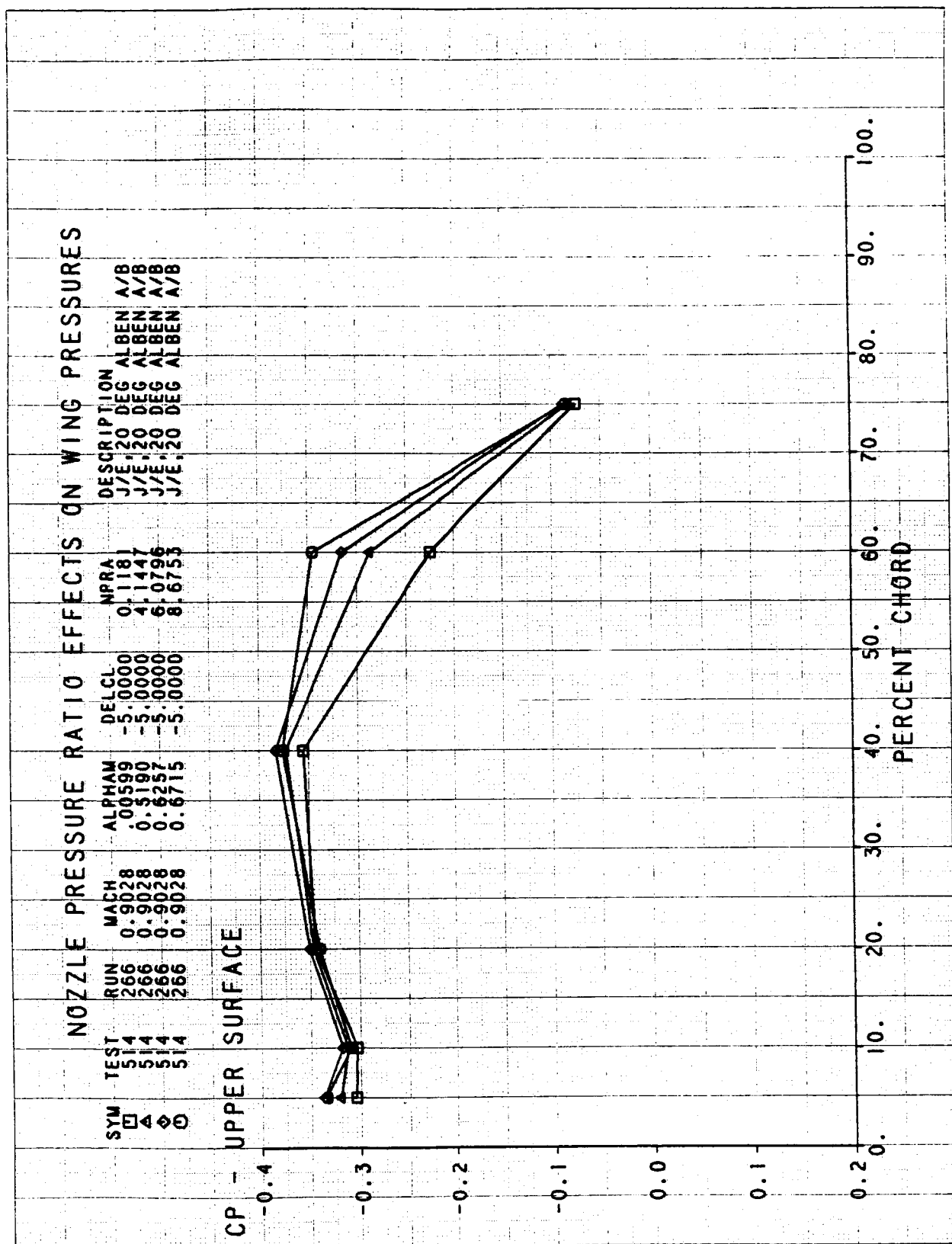




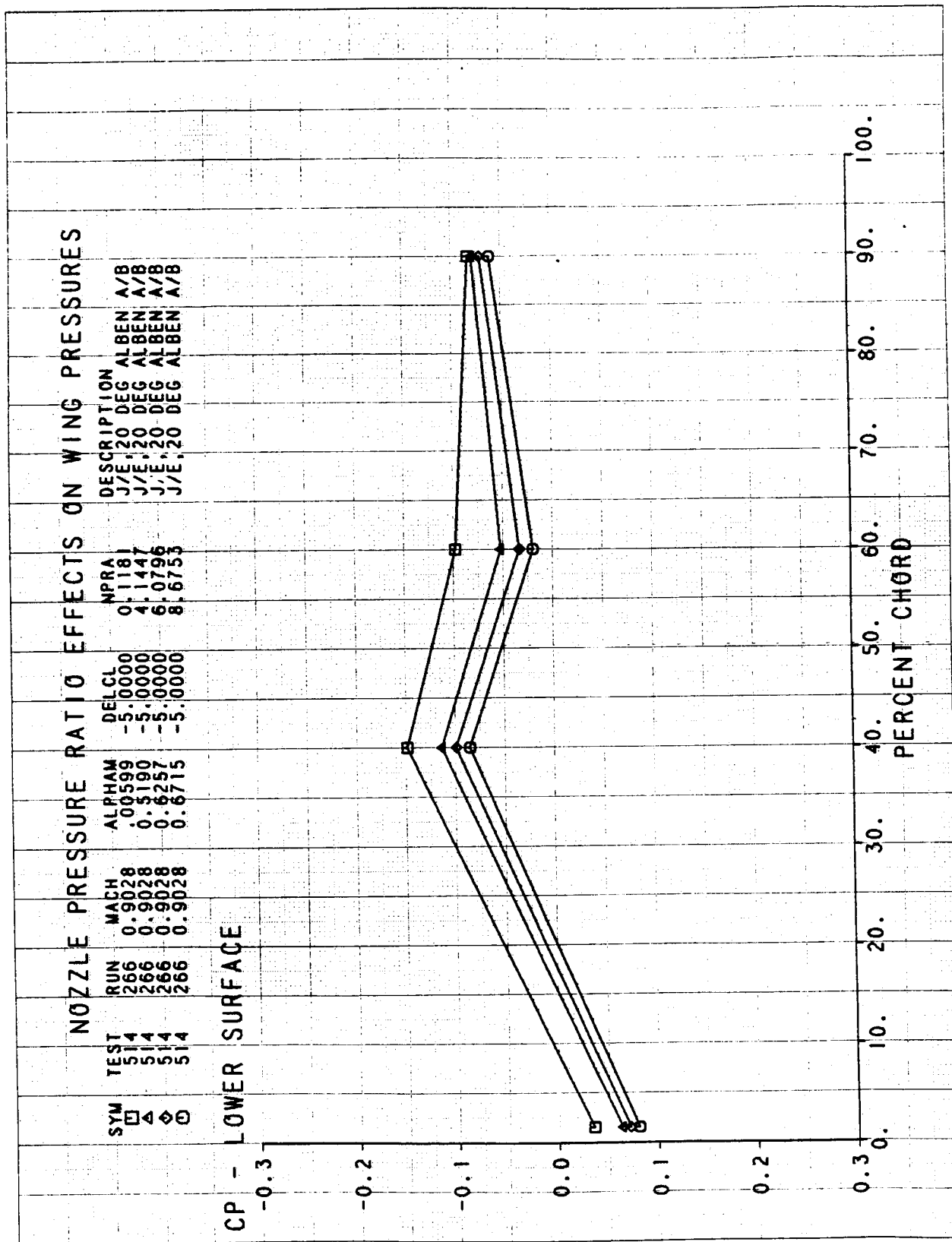




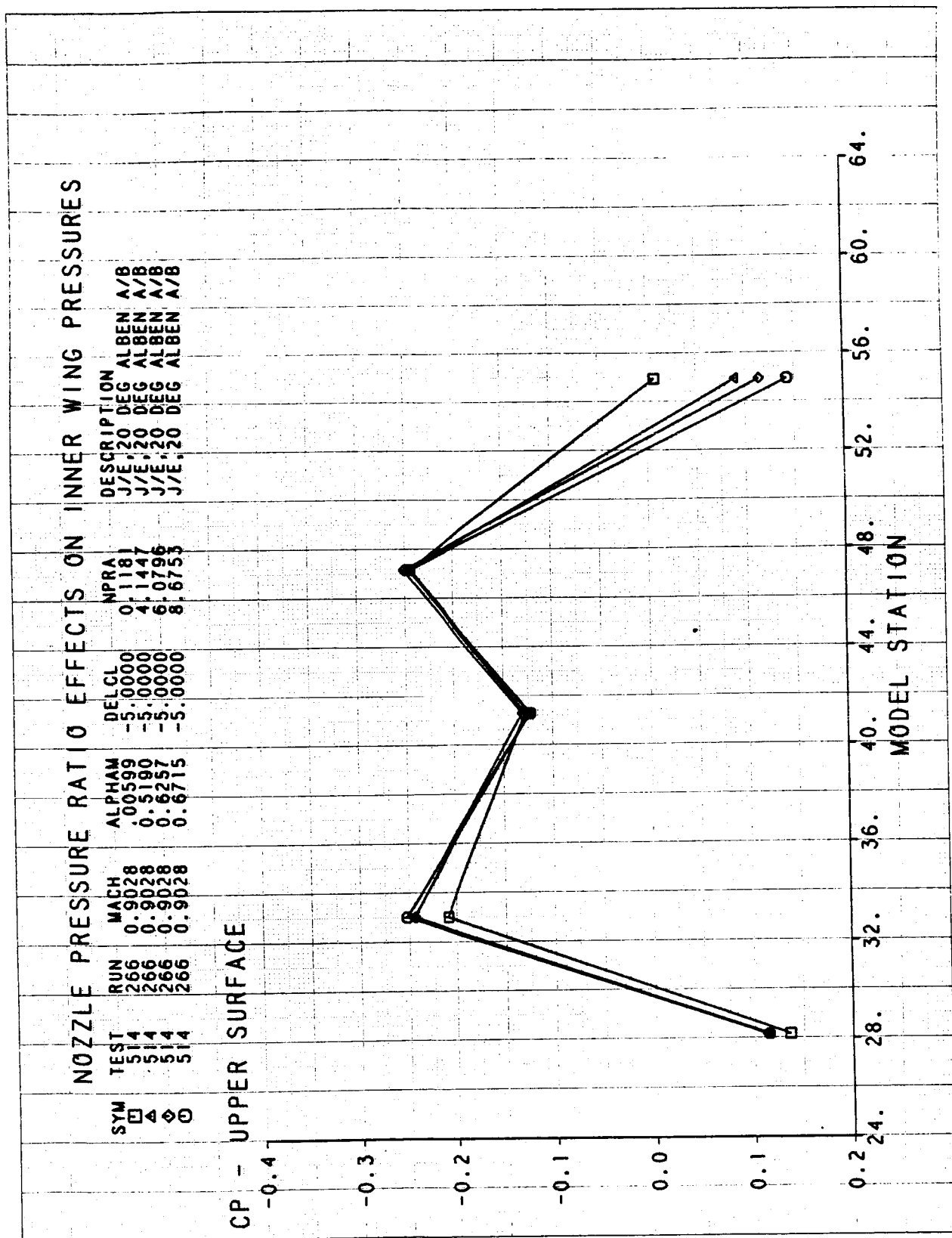


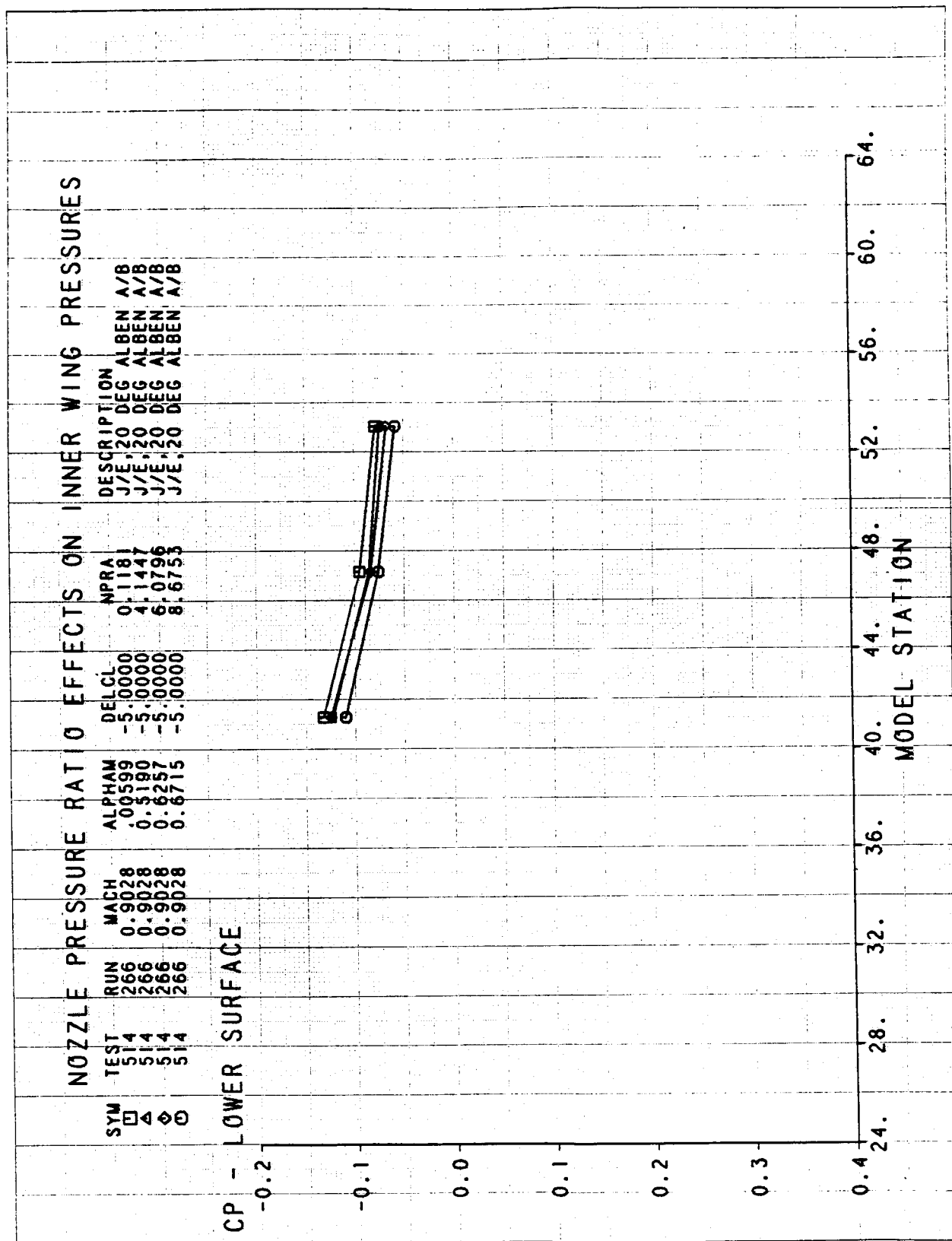


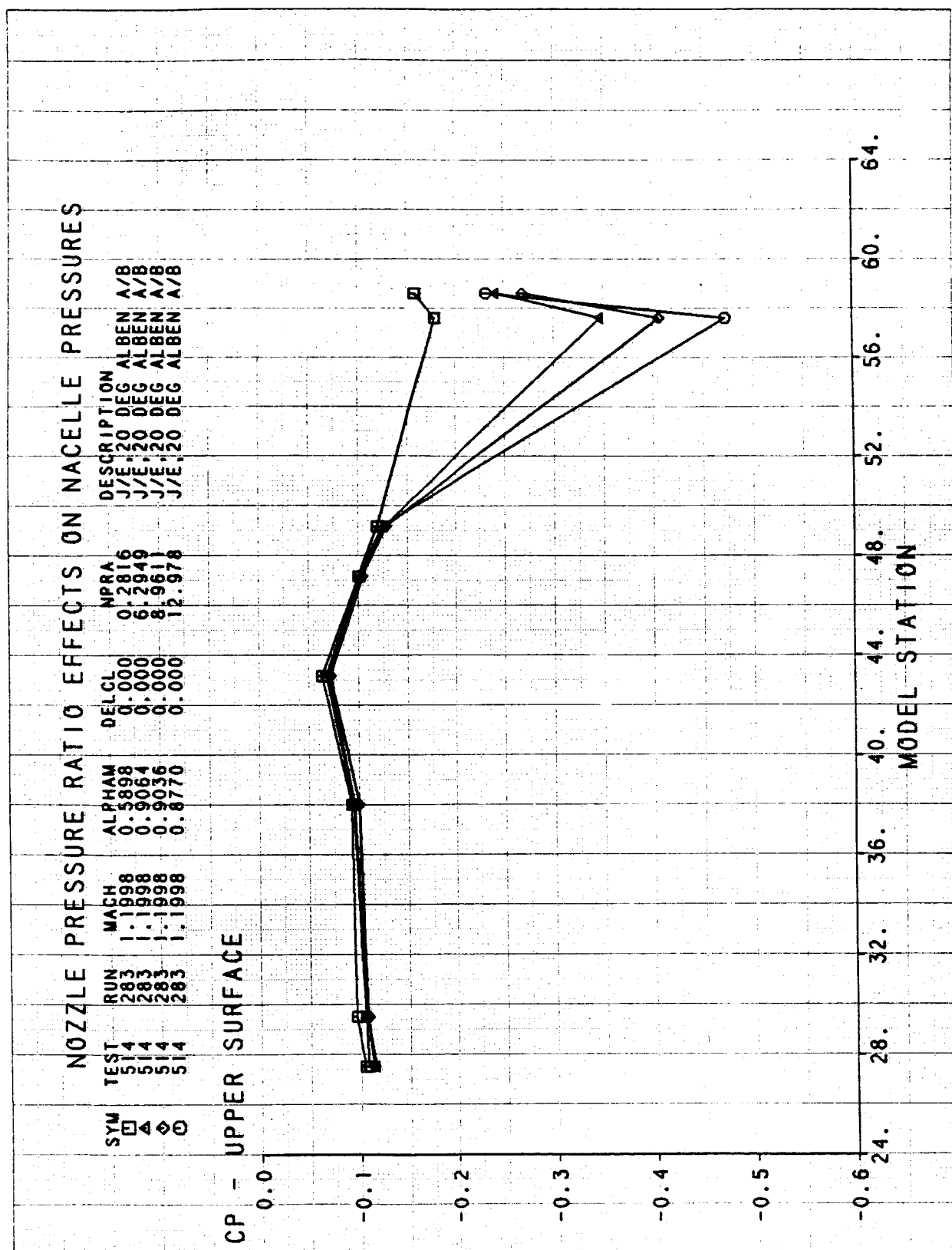


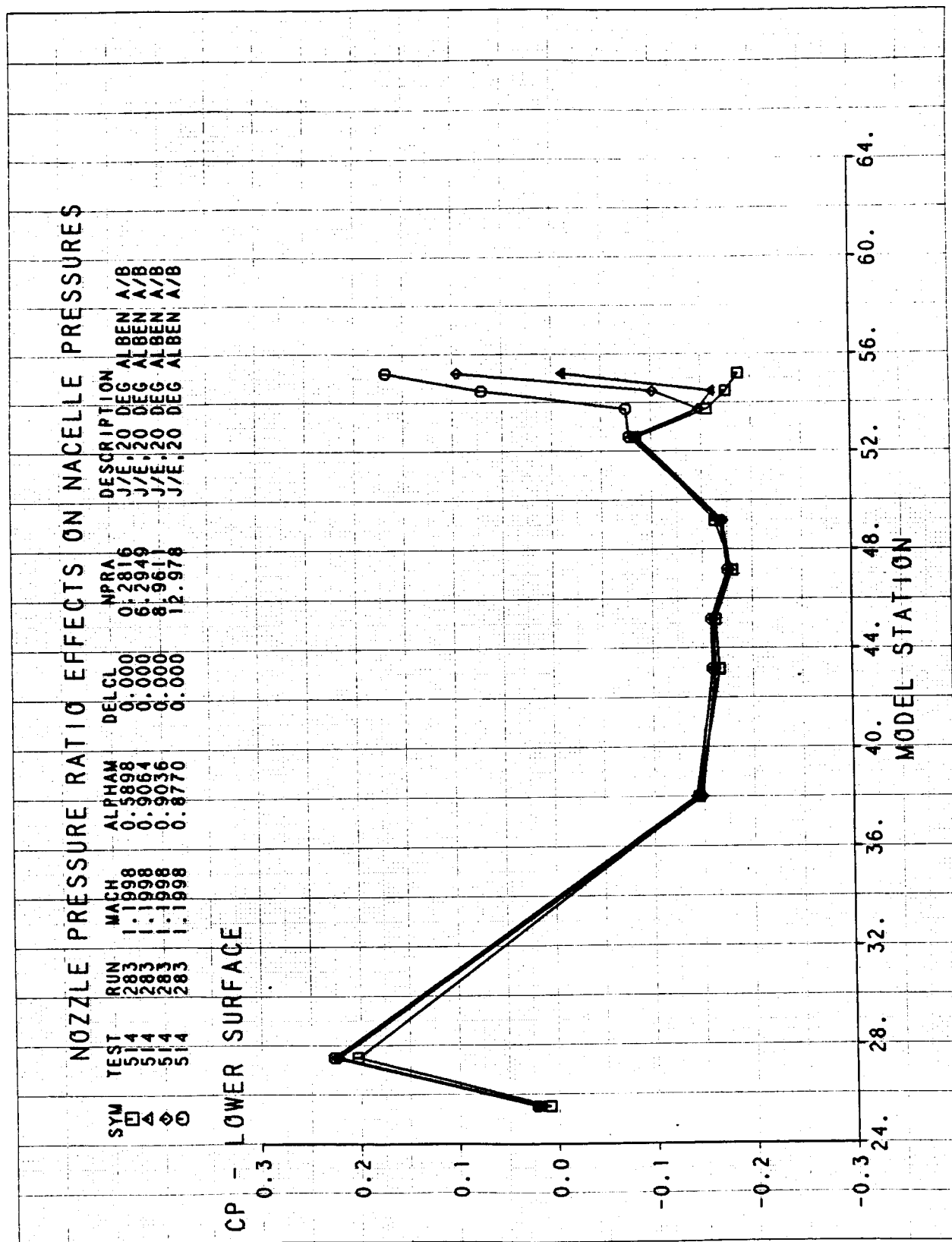


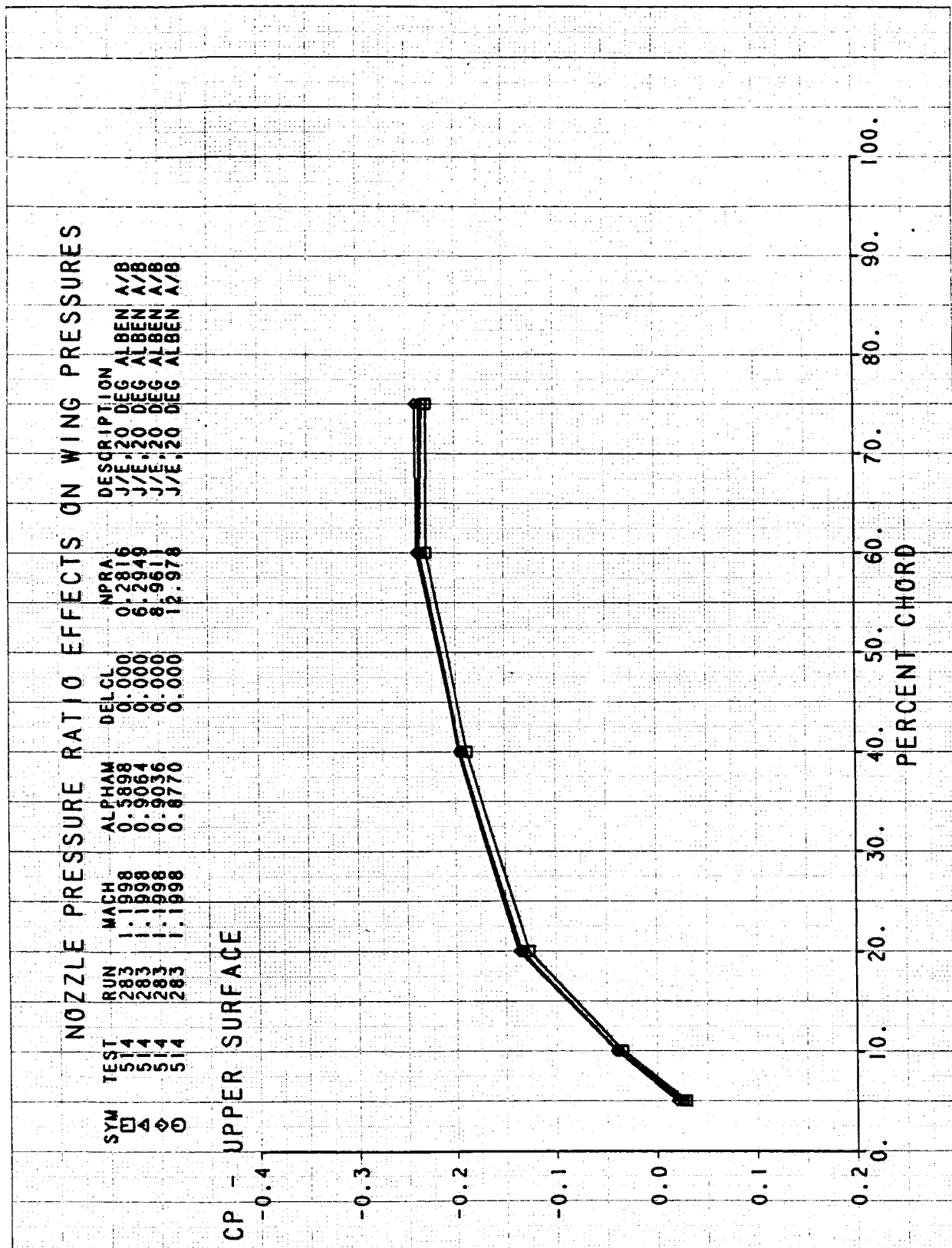
ORIGINAL PAGE IS  
OF POOR QUALITY

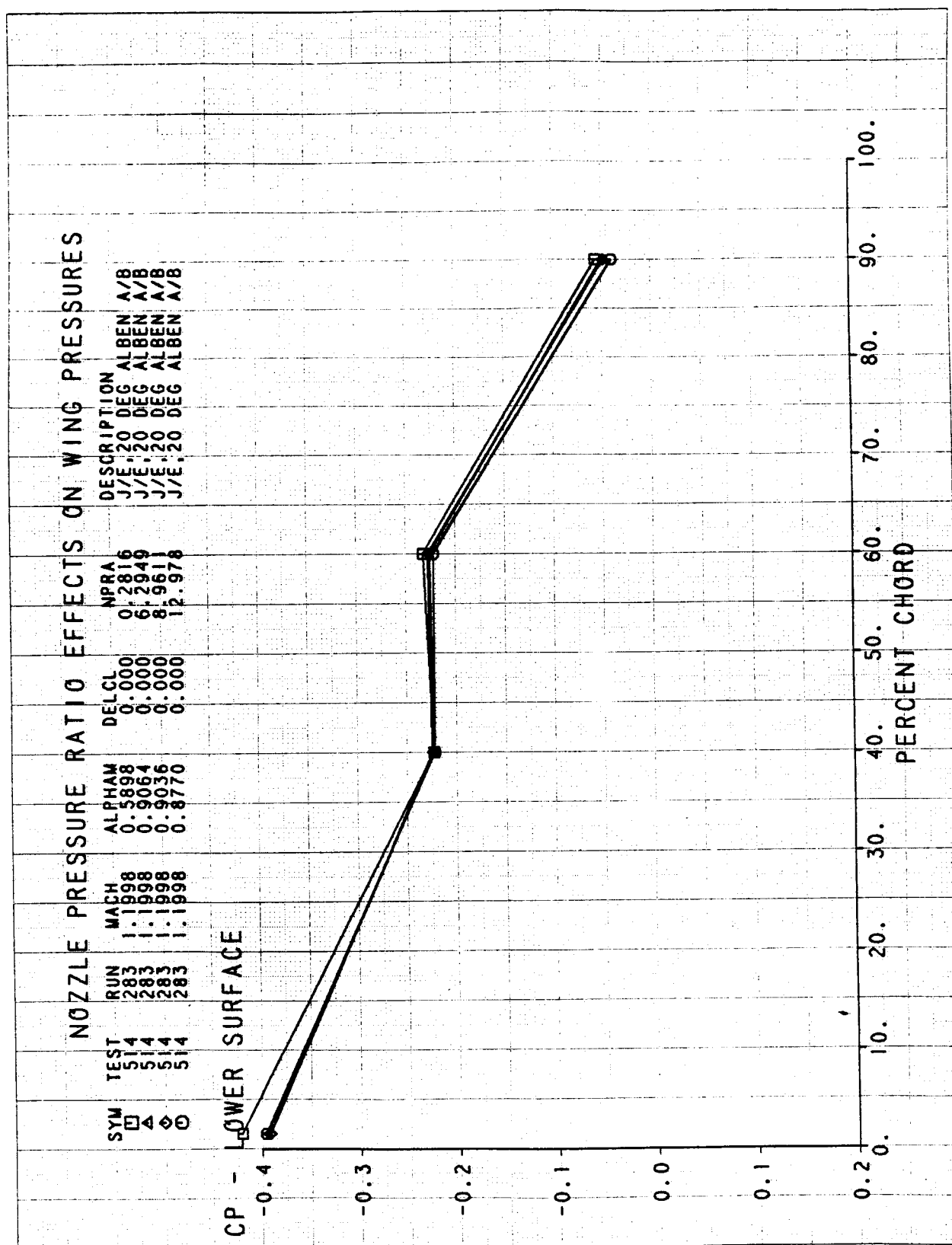


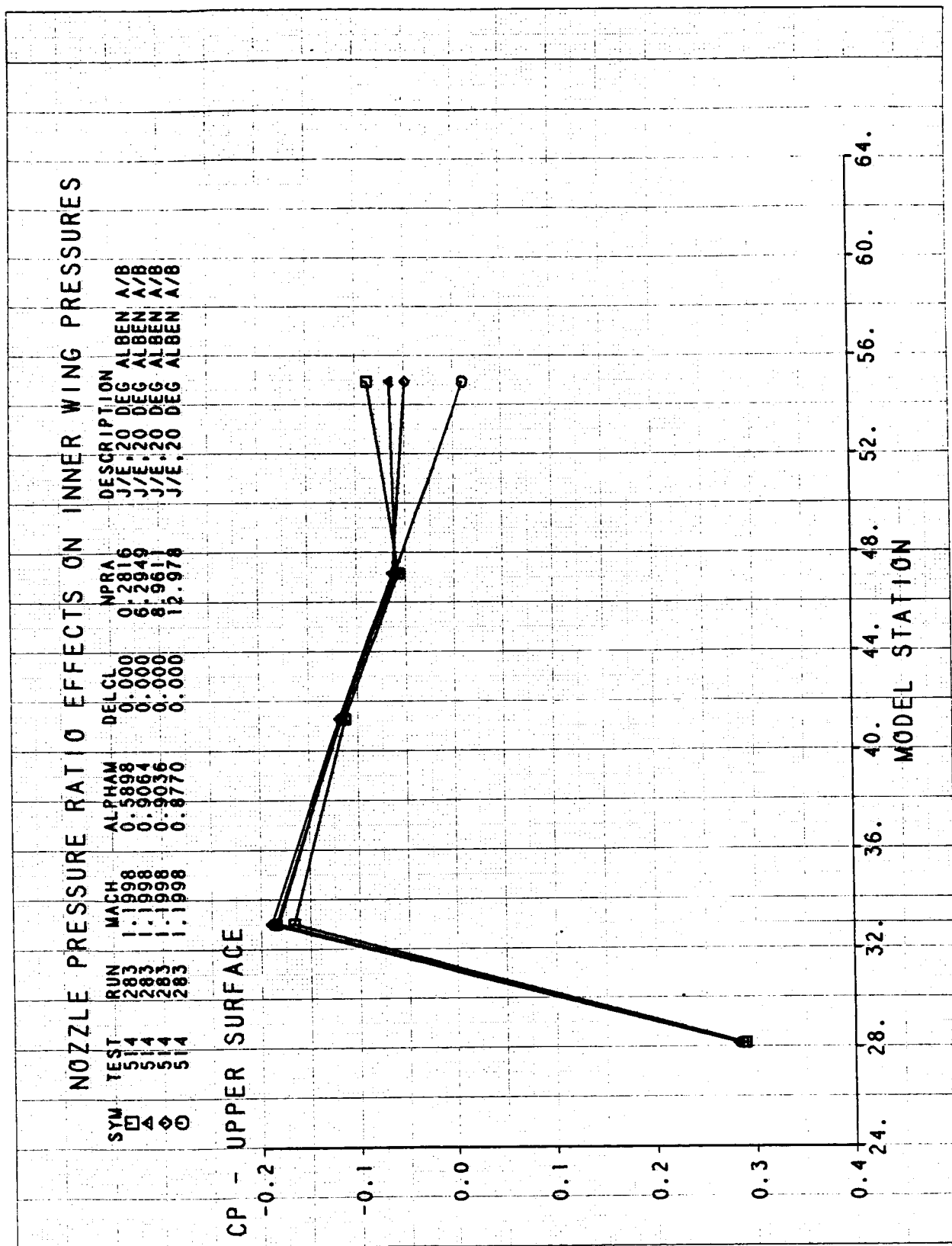




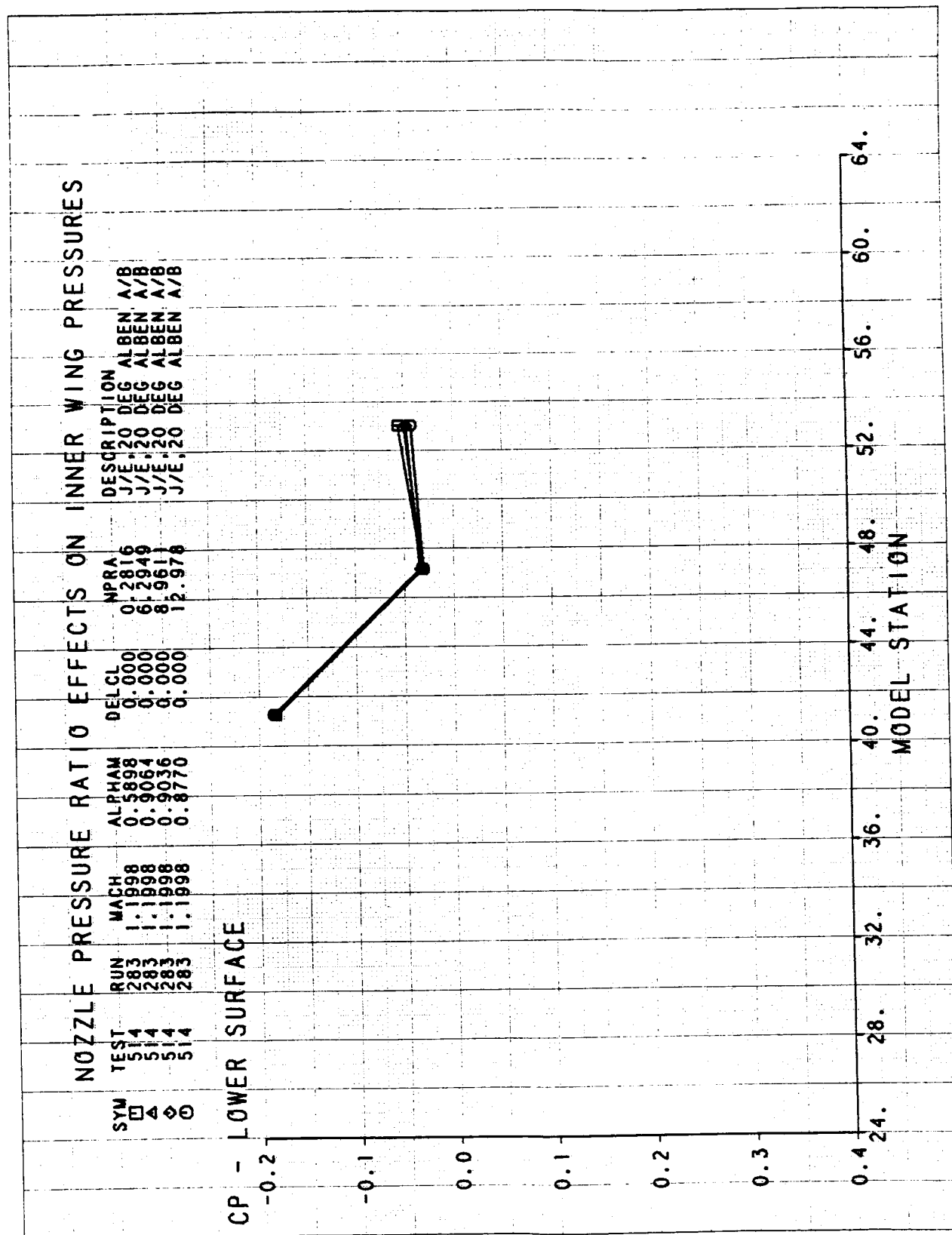


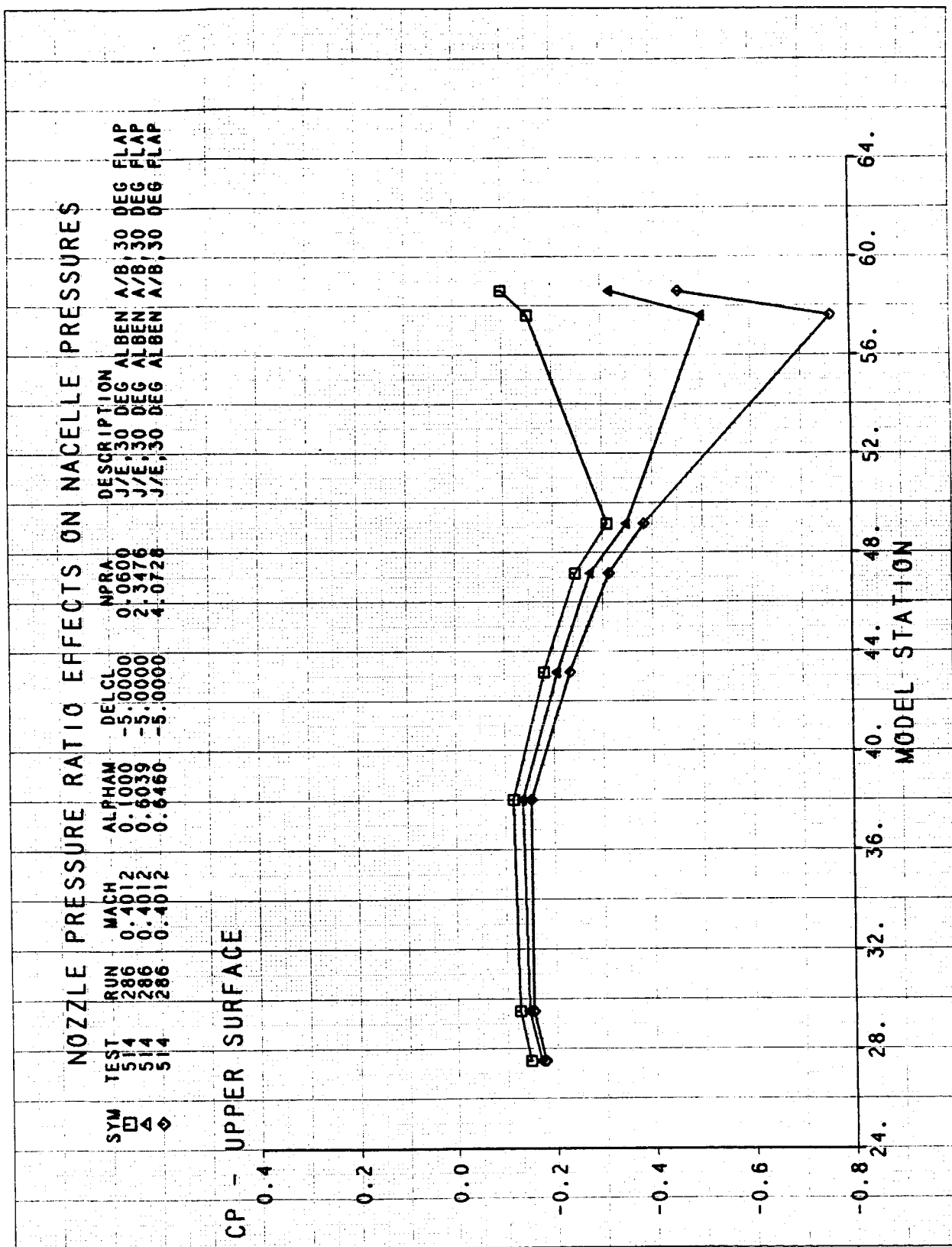


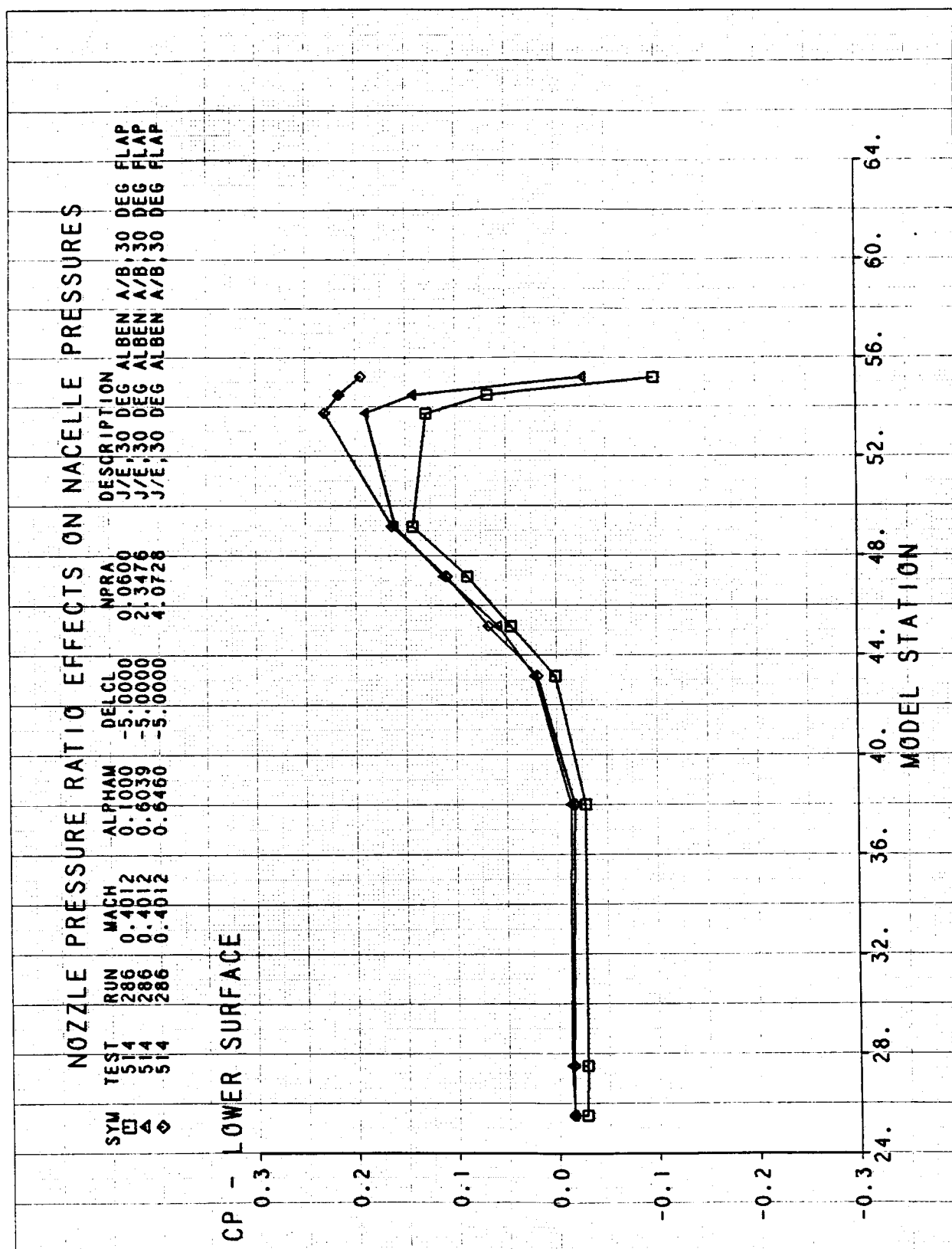


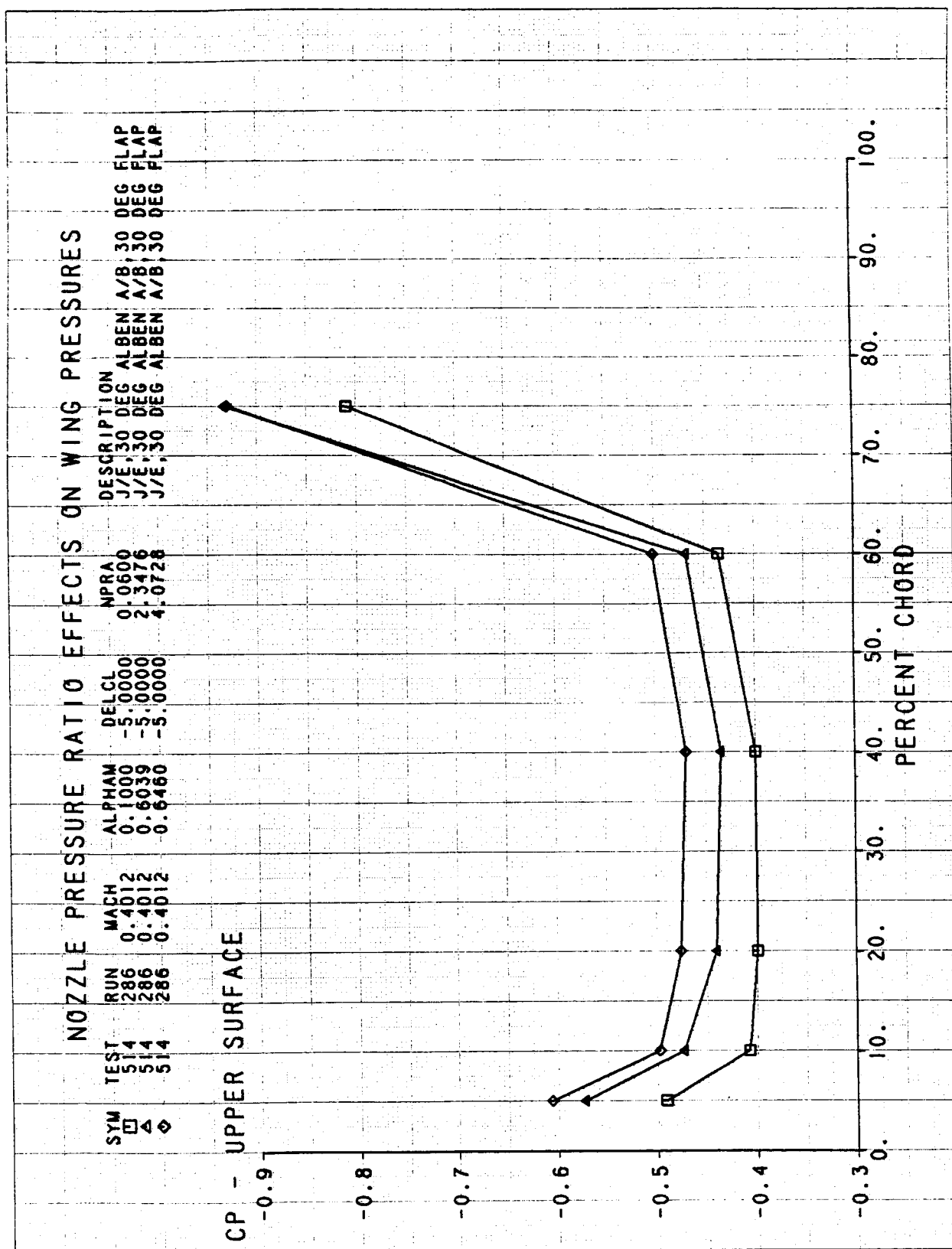


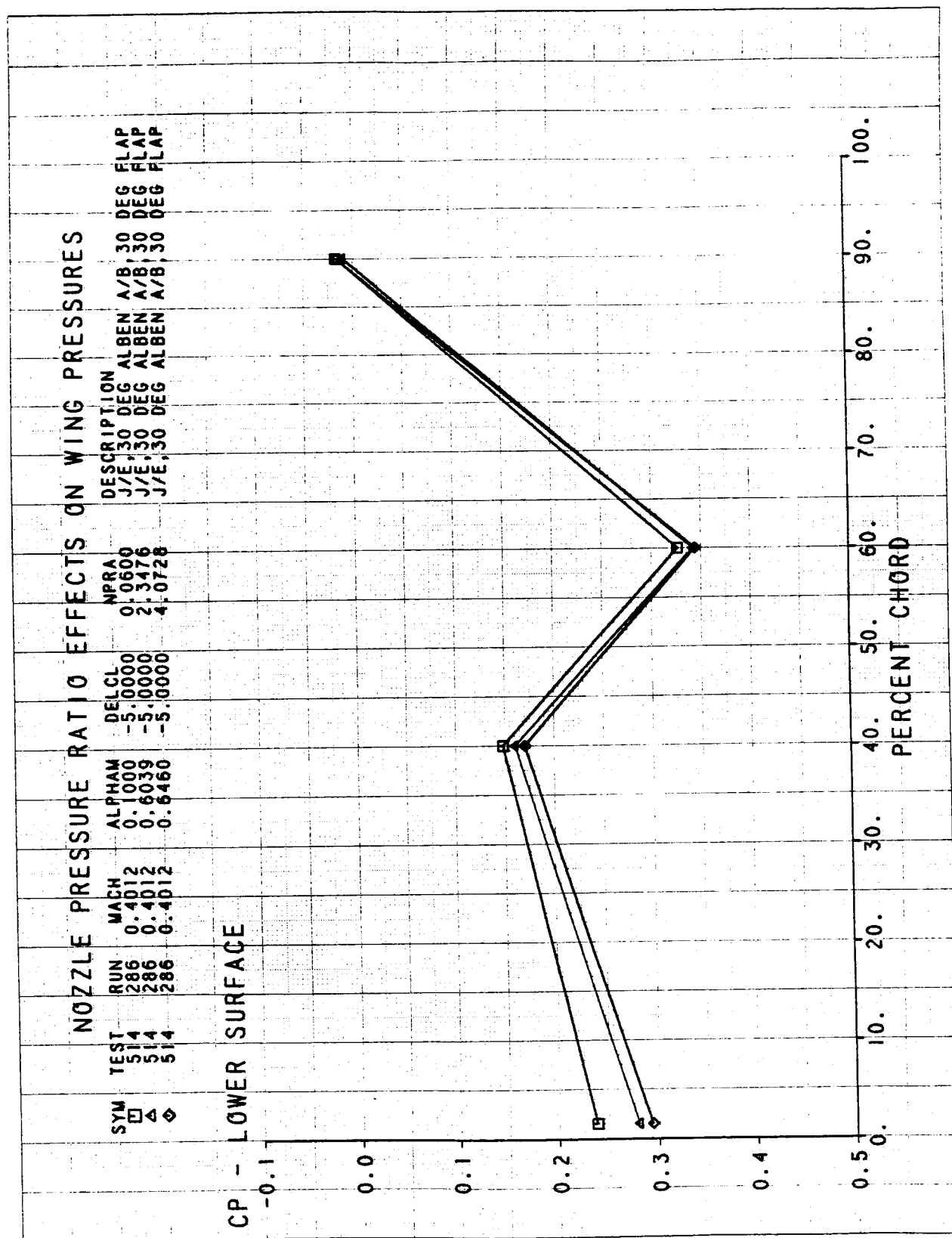


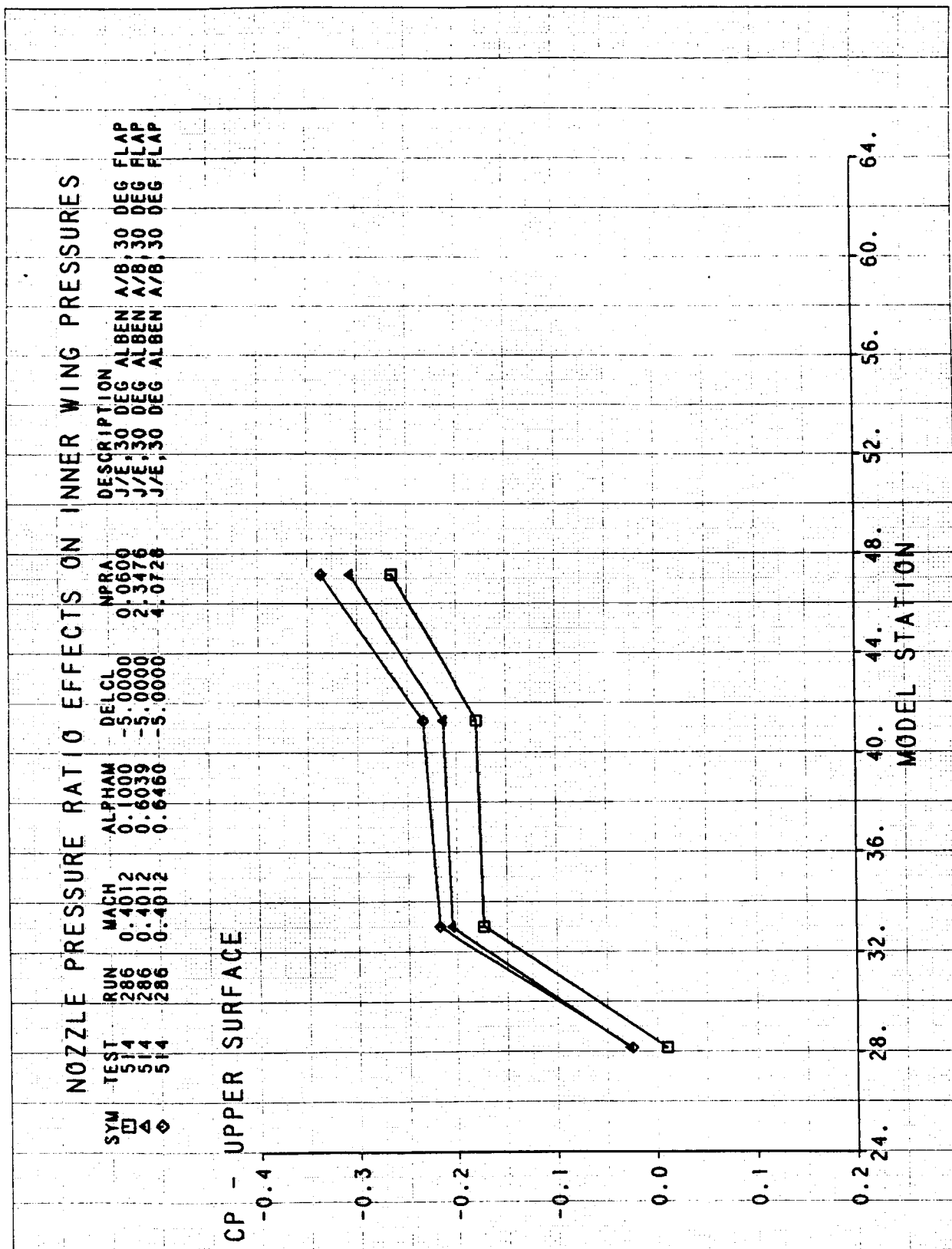


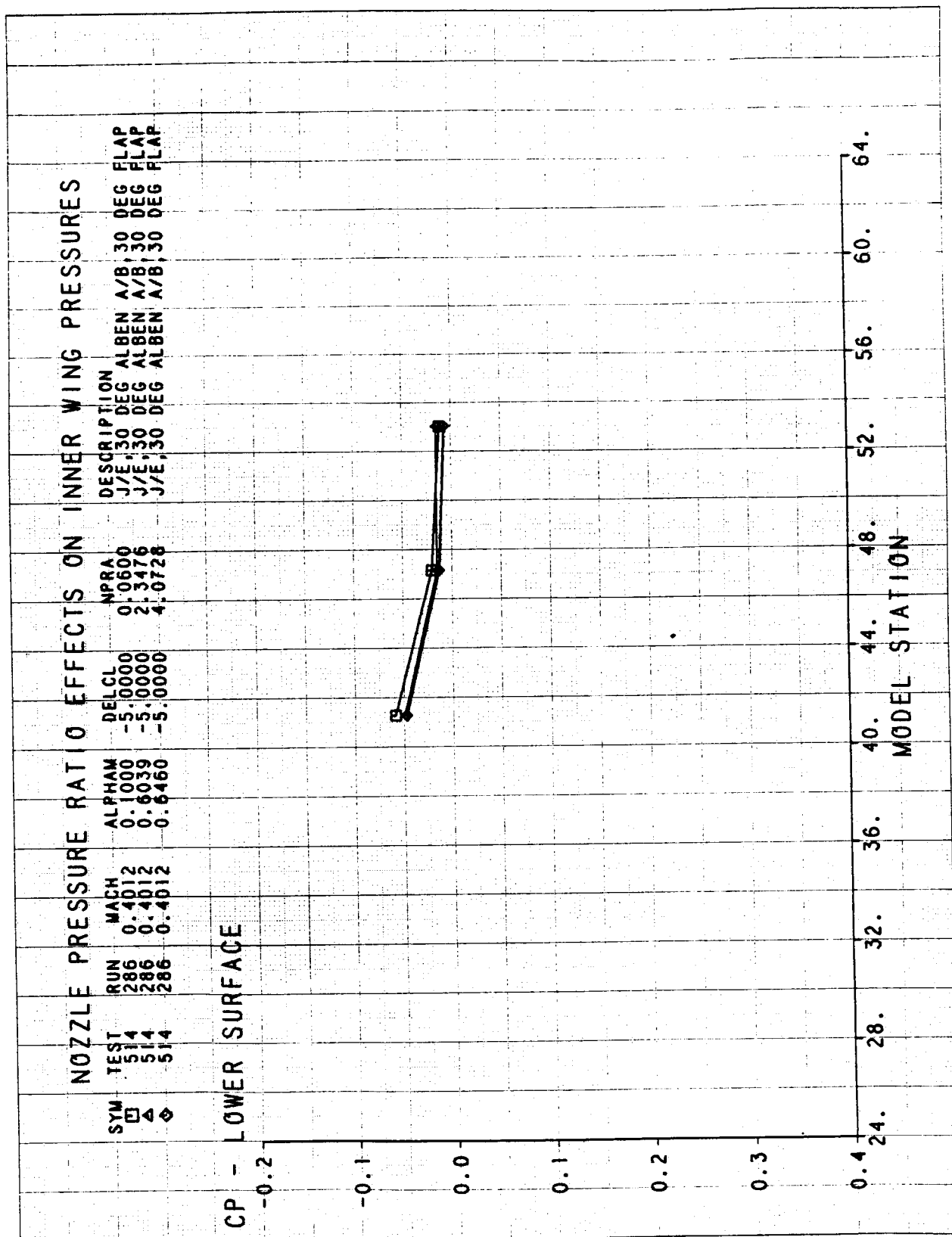


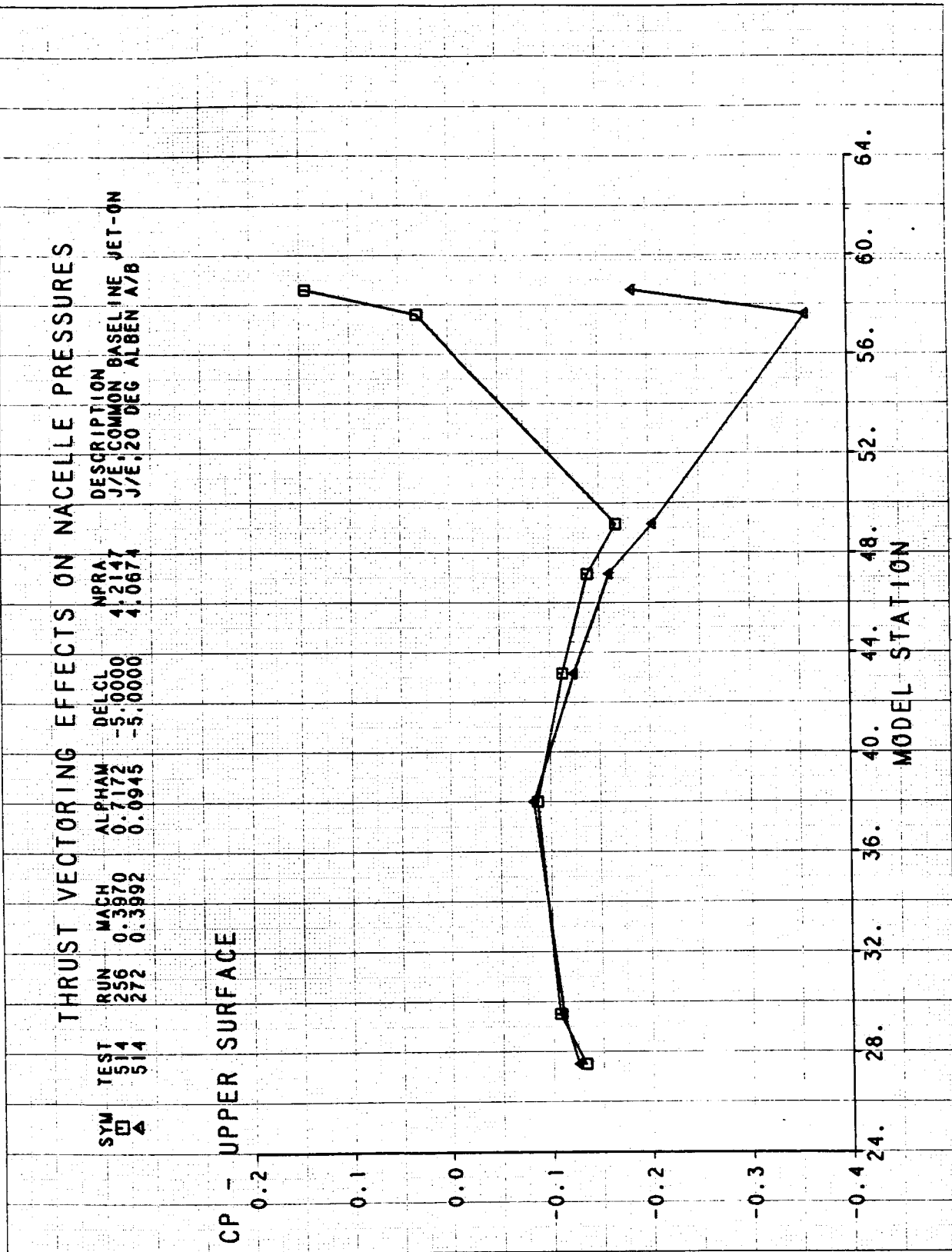










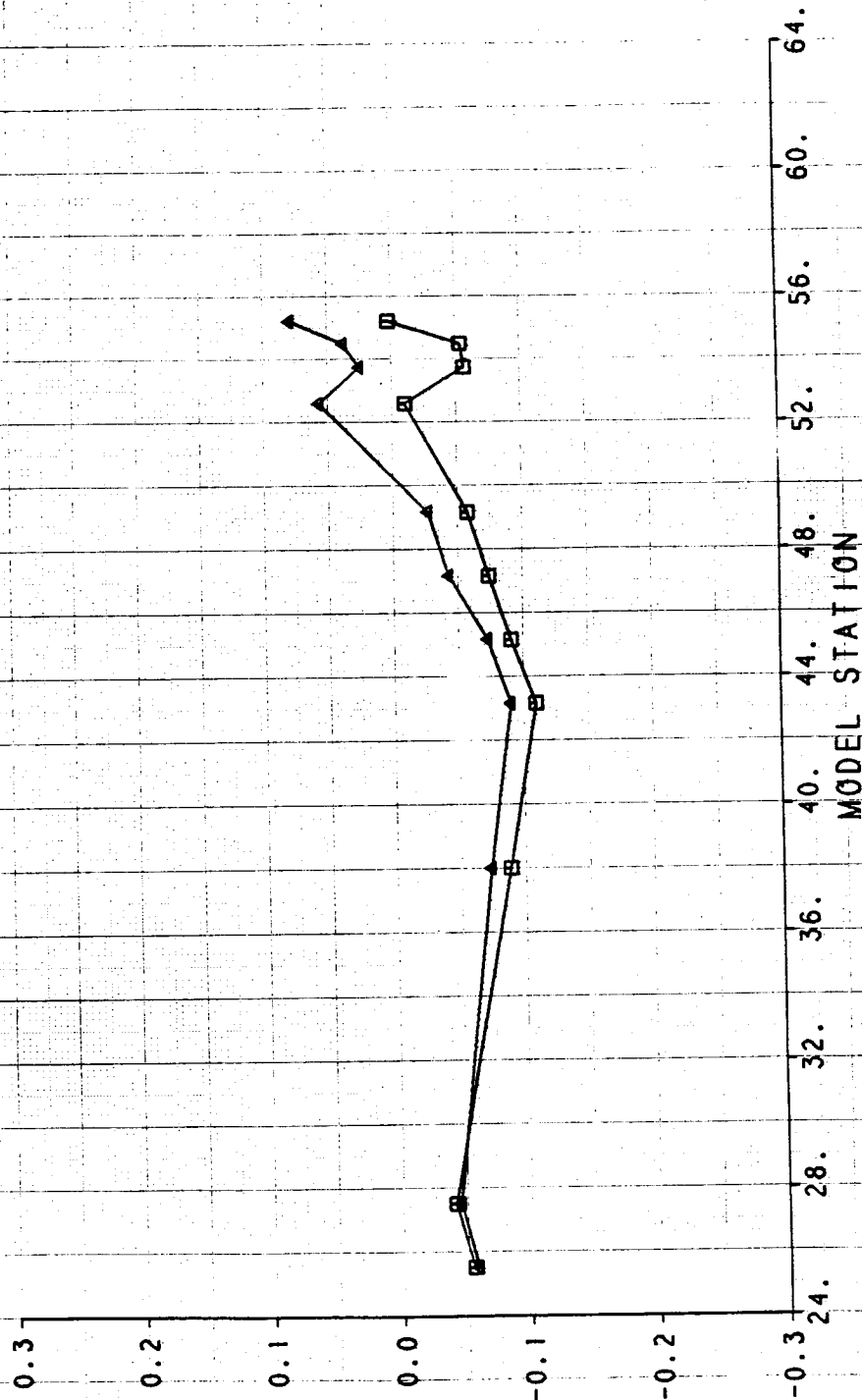


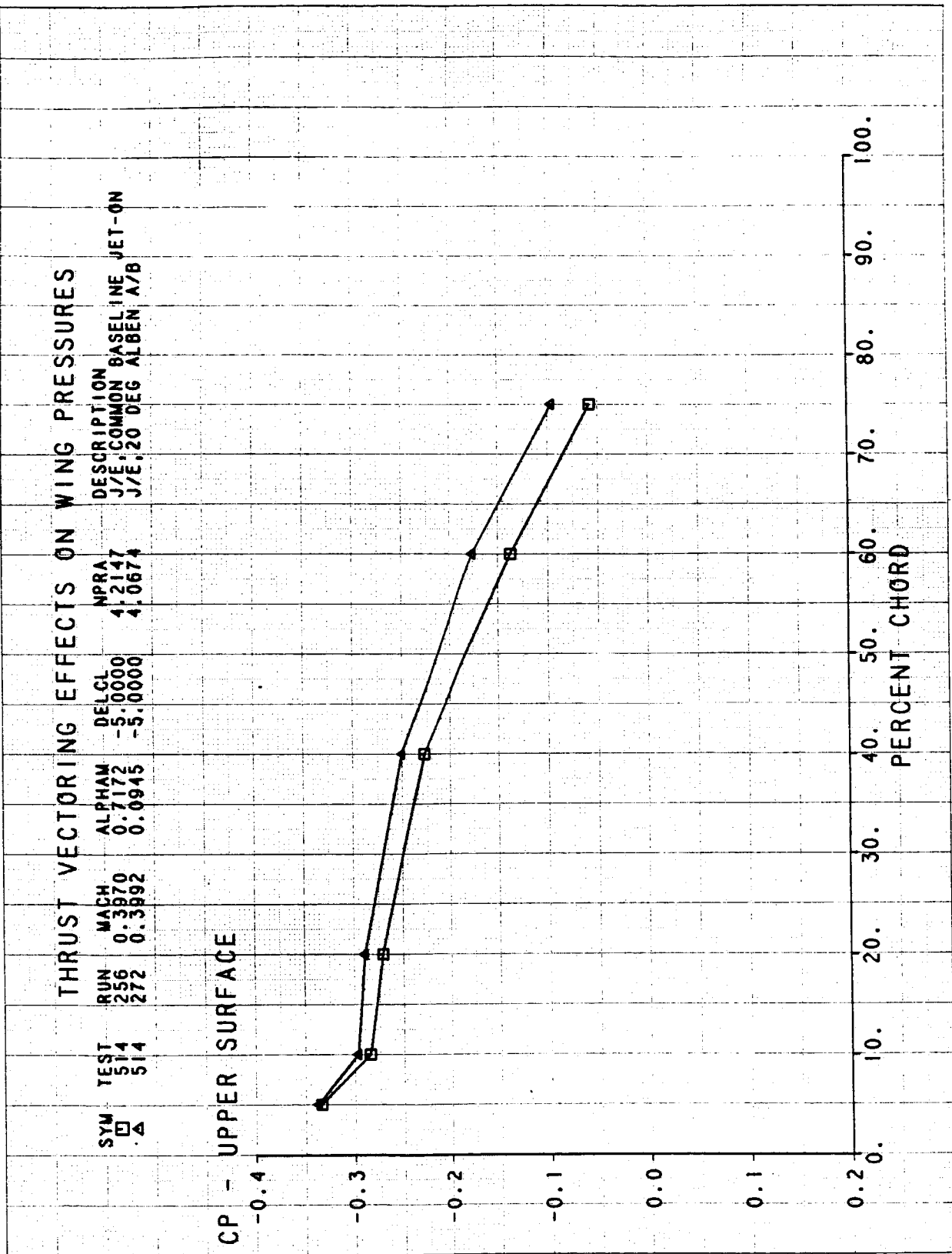


# THRUST VECTORING EFFECTS ON NACELLE PRESSURES

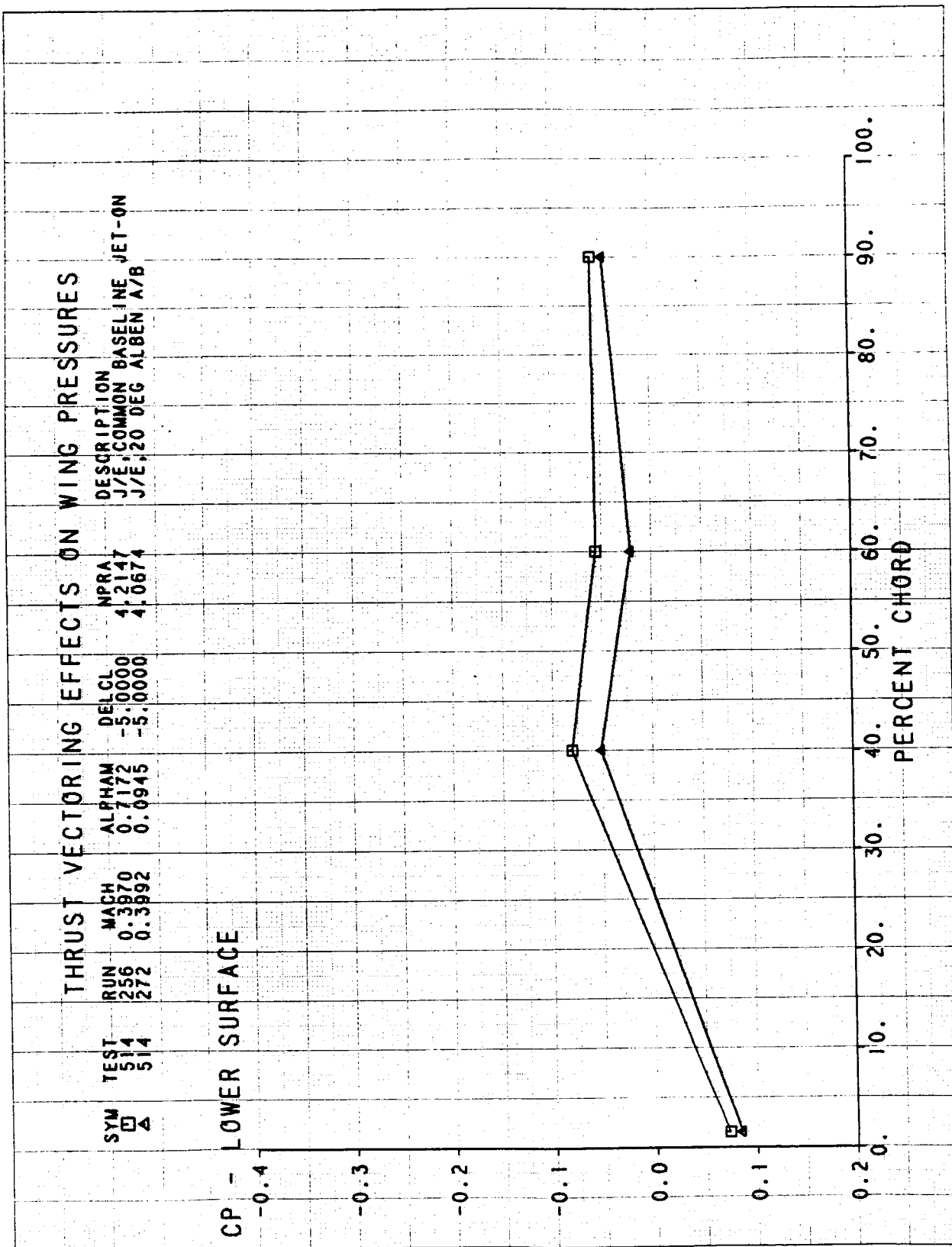
SYM	TEST	RUN	MACH	ALPHAM	DELCL	NPRA	DESCRIPTION
□	514	256	0.3870	0.7172	-5.0000	4.2147	J/E, COMMON BASELINE JET-ON
△	514	272	0.3992	0.0945	-5.0000	4.0674	J/E, 20 DEG ALBEN A/B

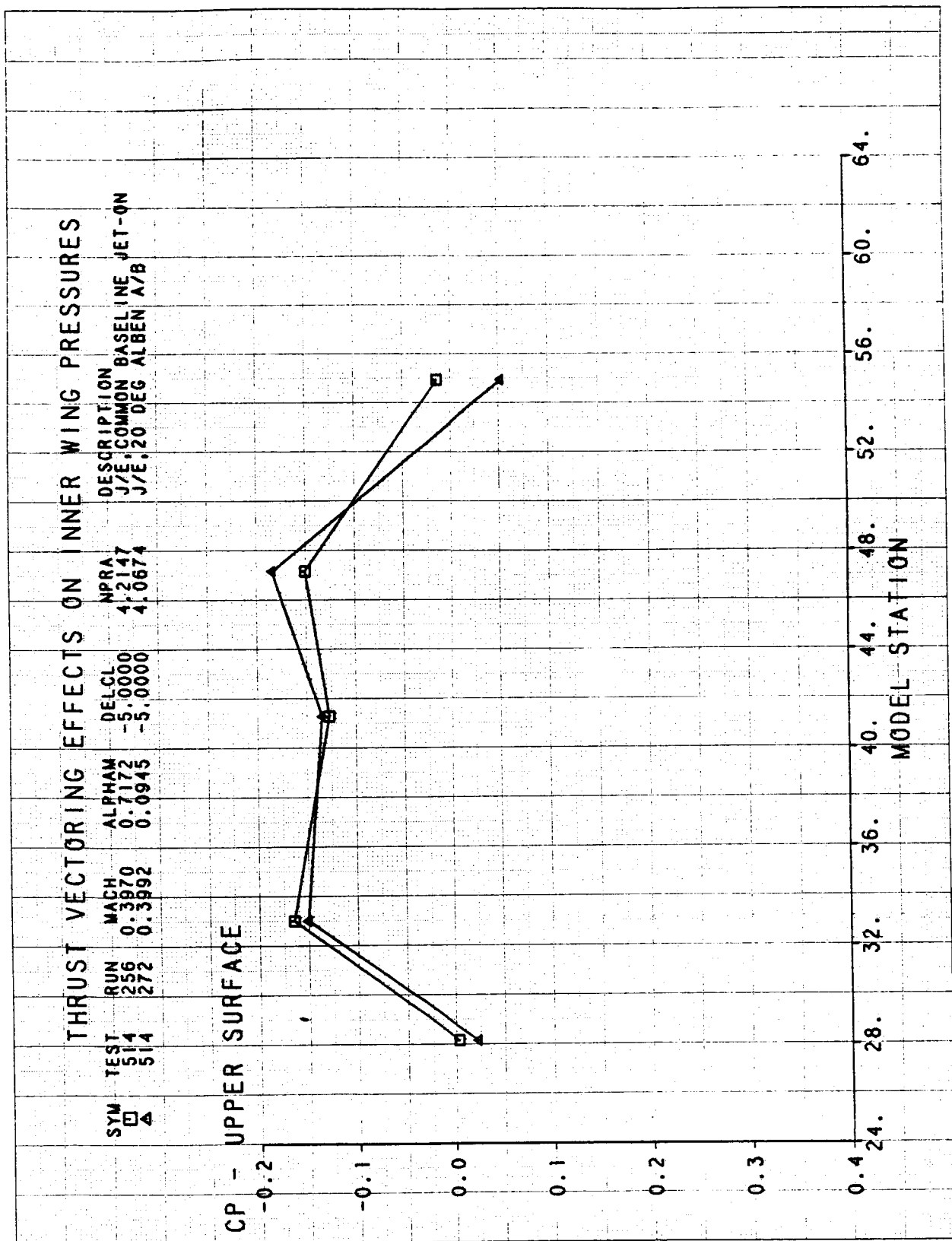
CP - LOWER SURFACE

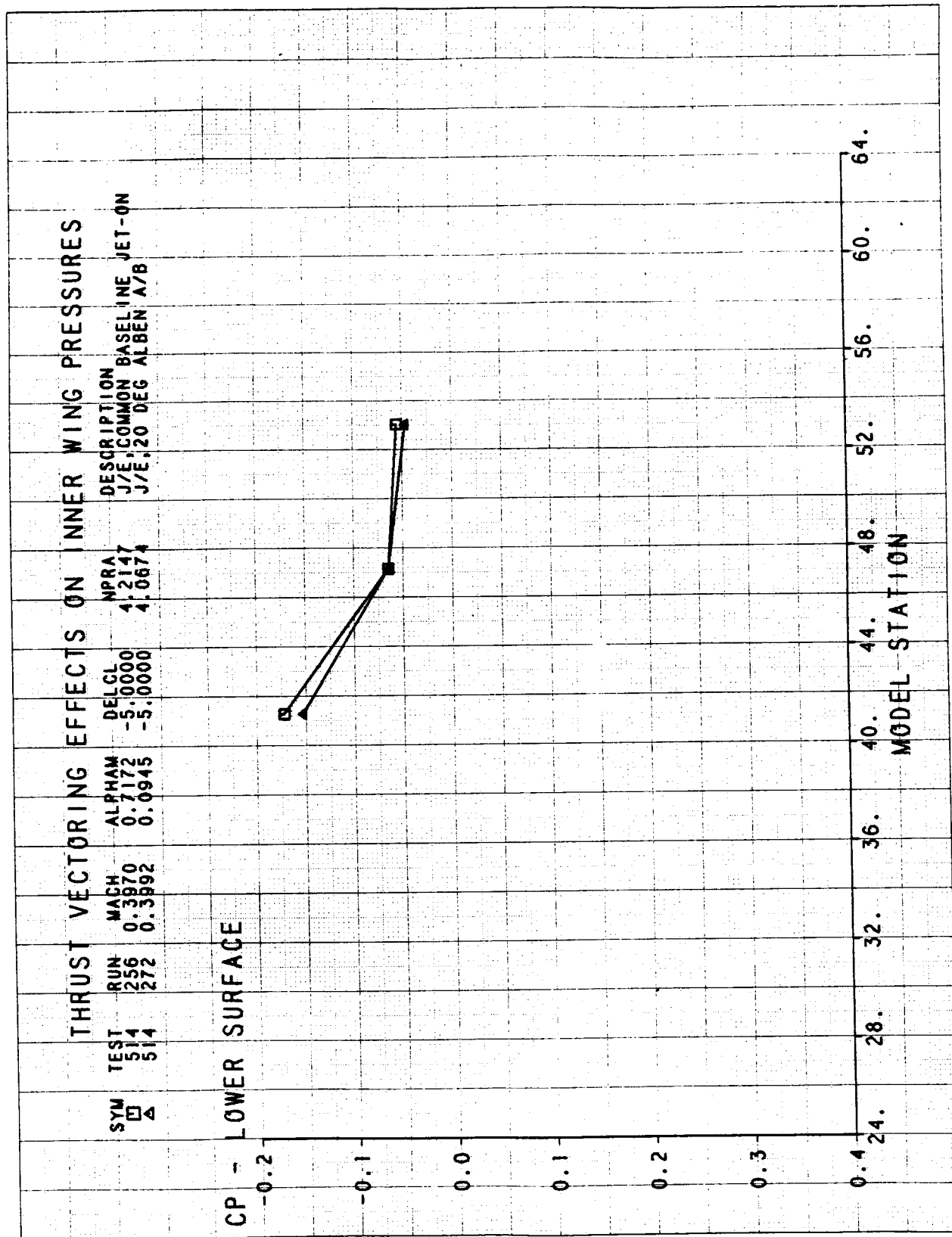


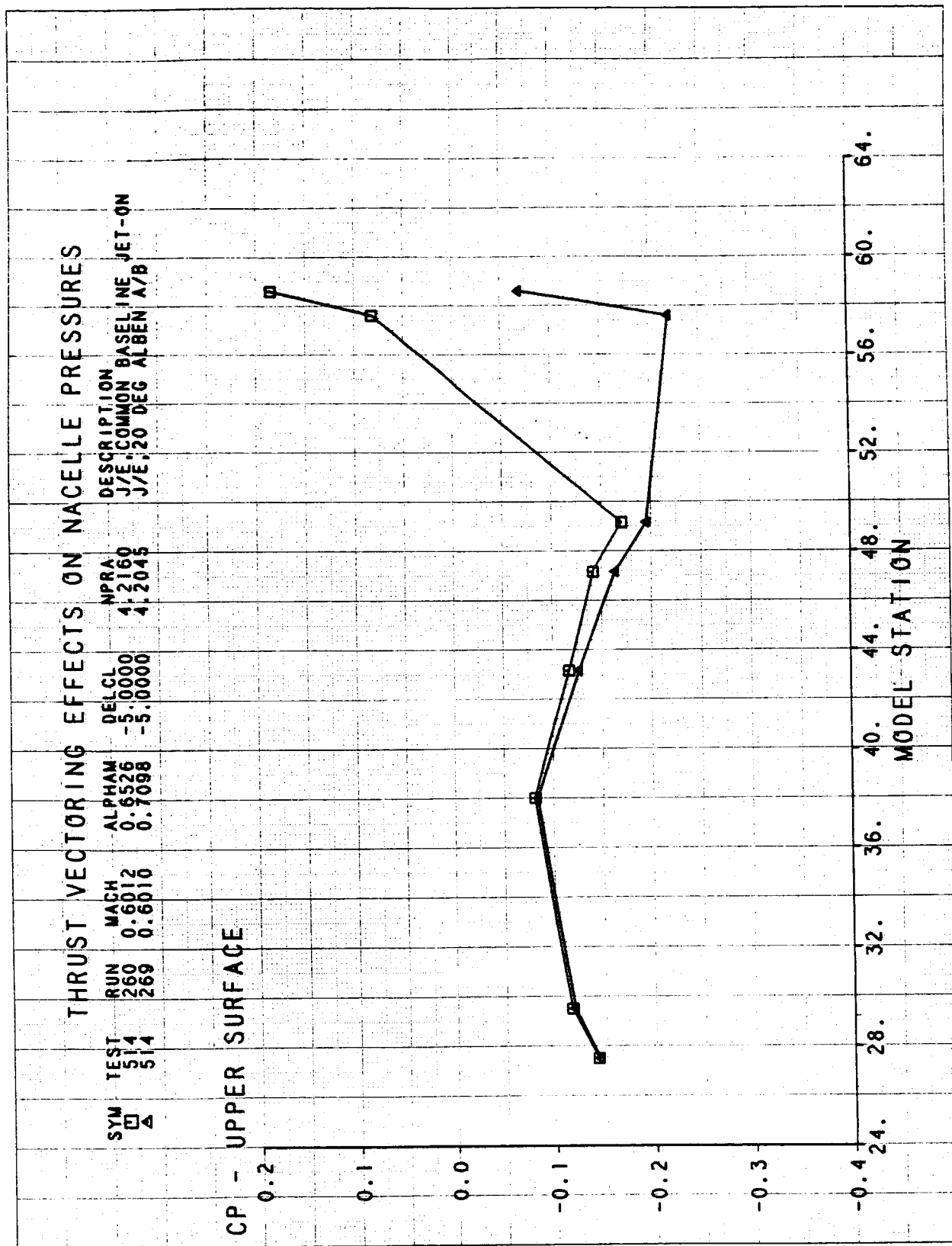


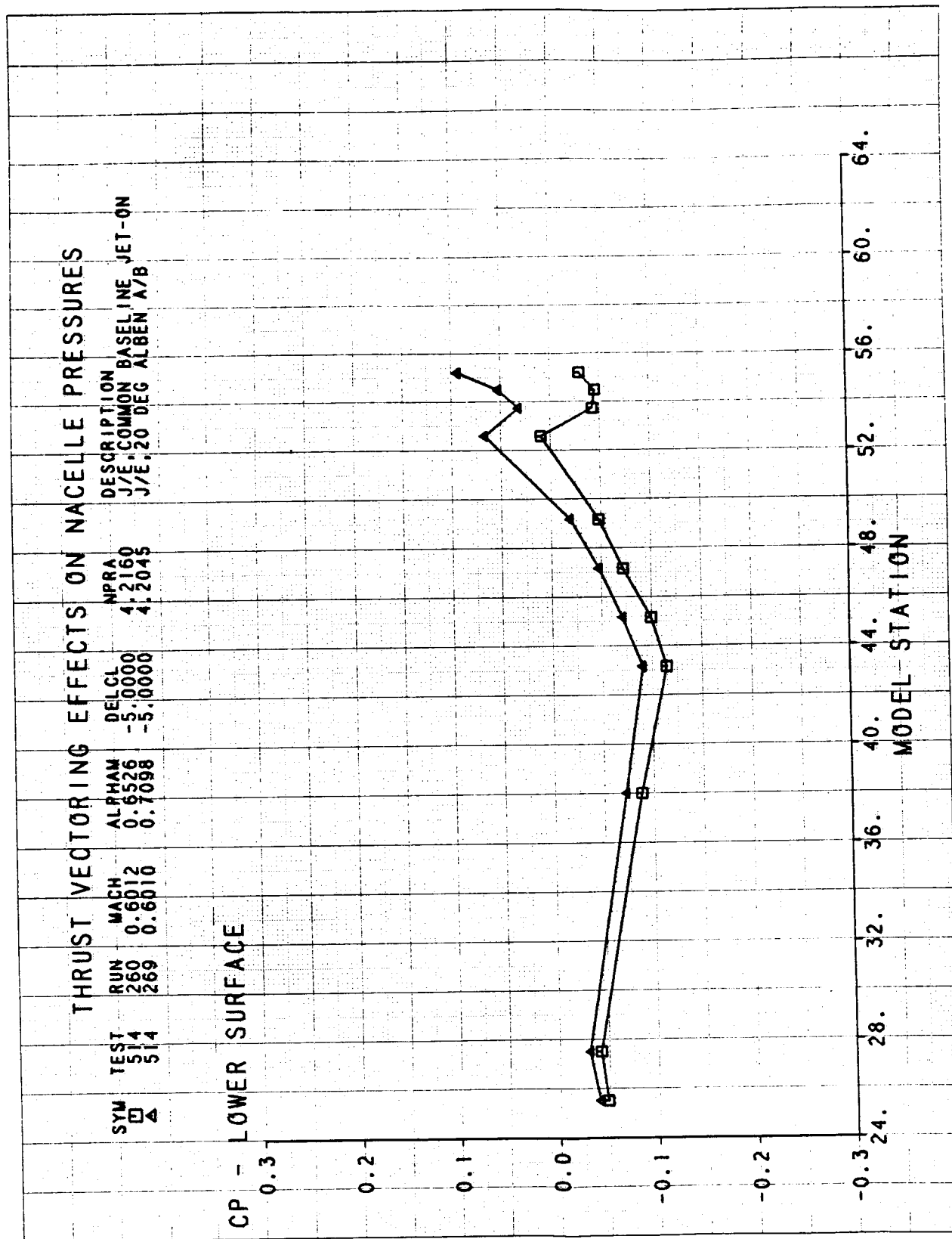
C-4

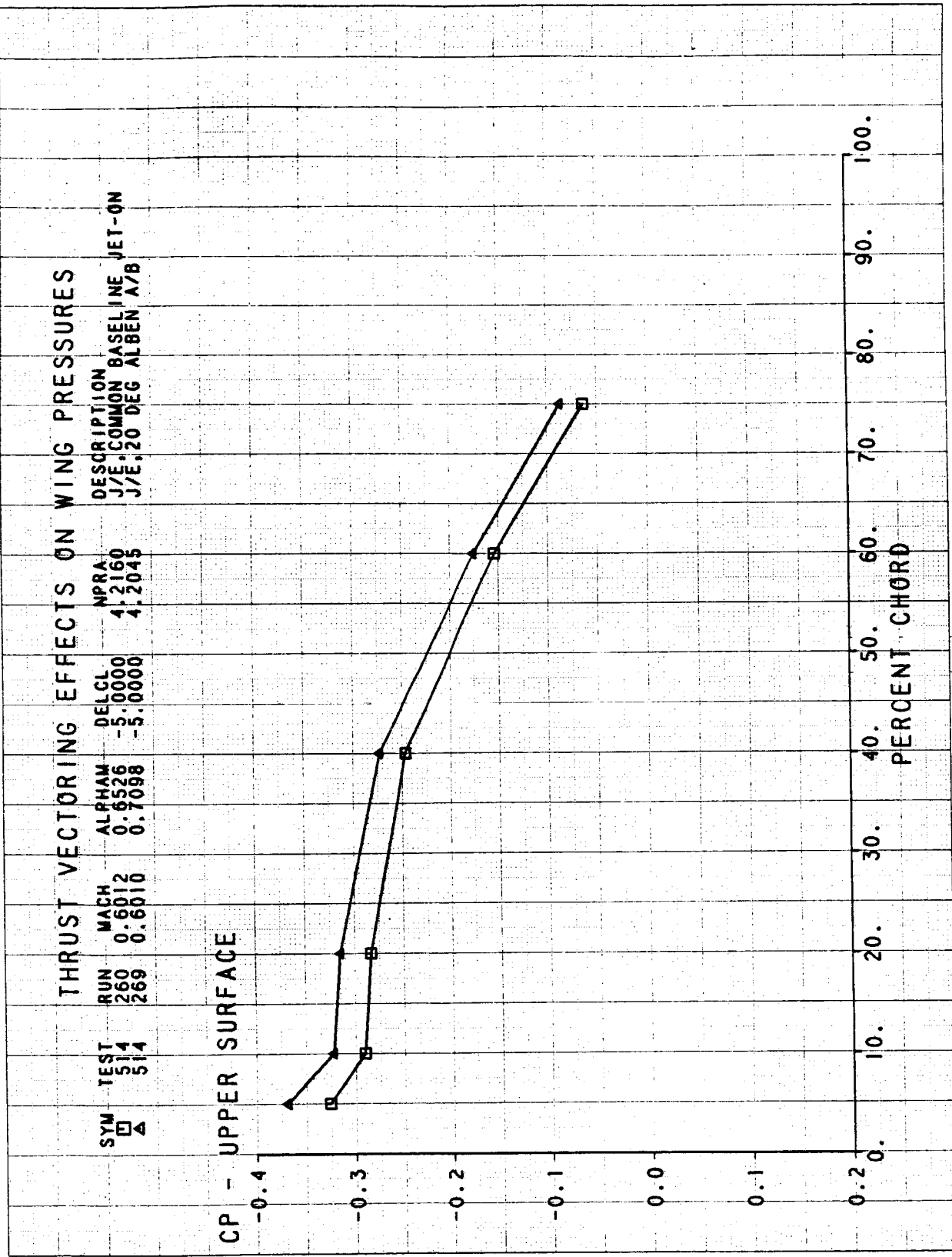




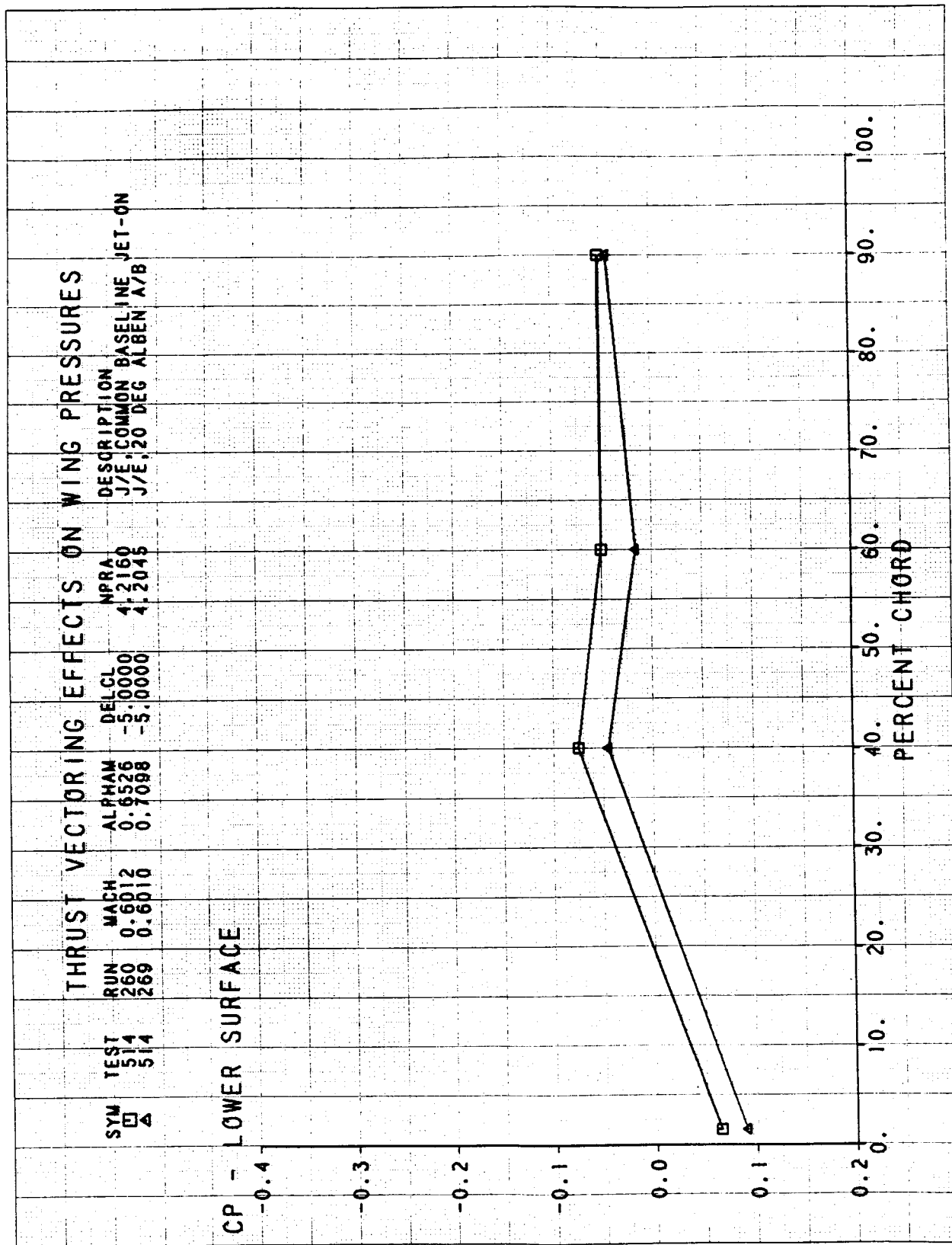








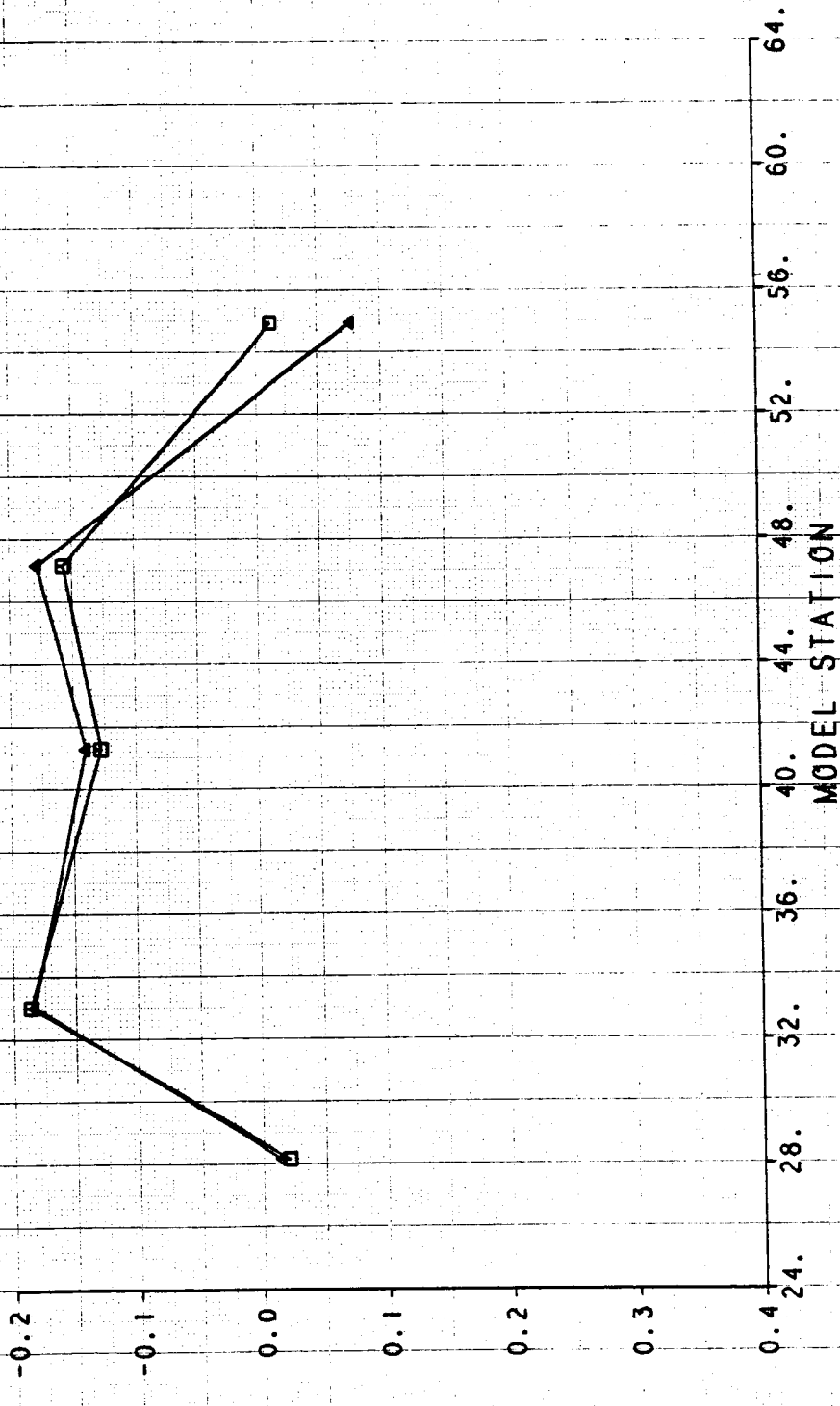


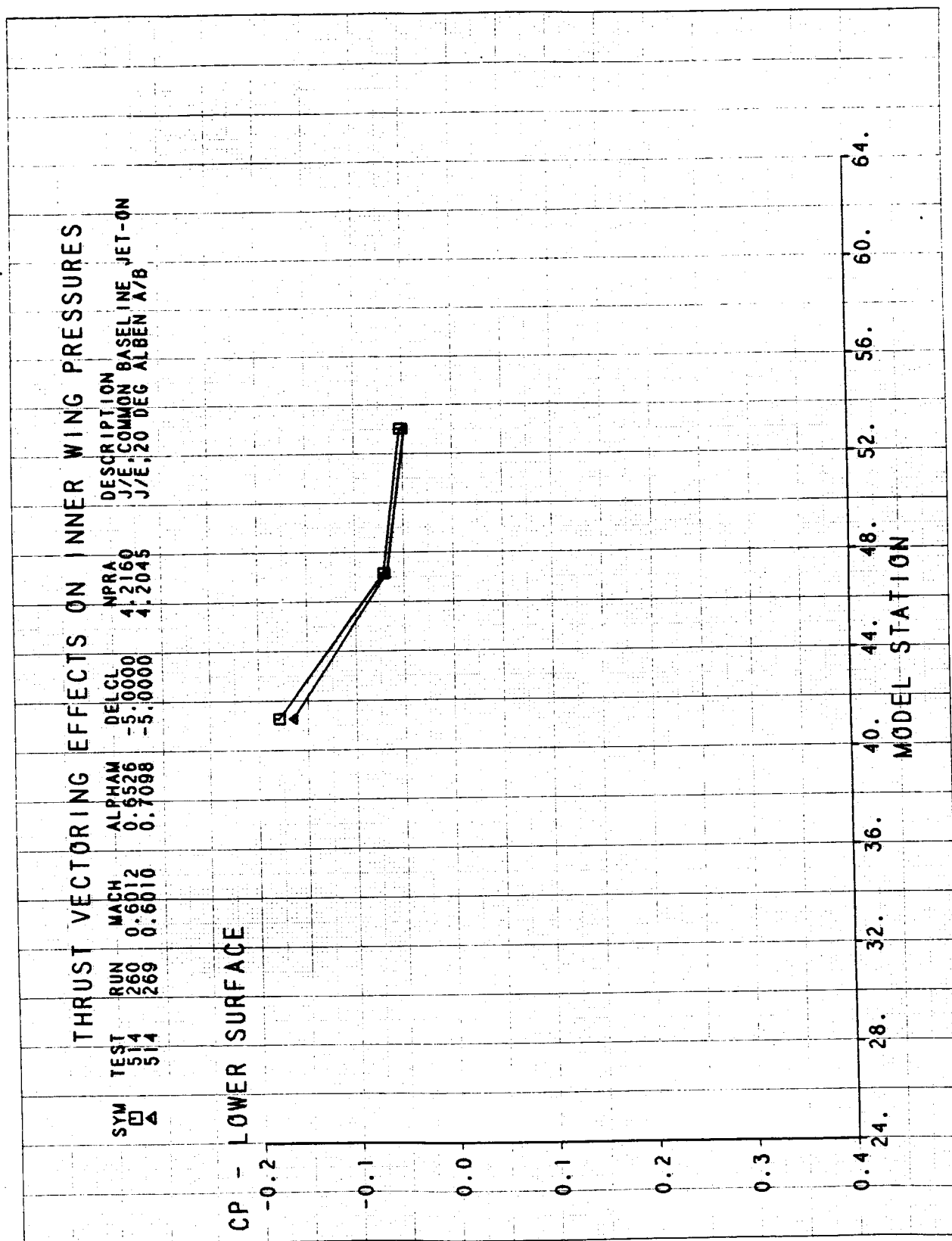


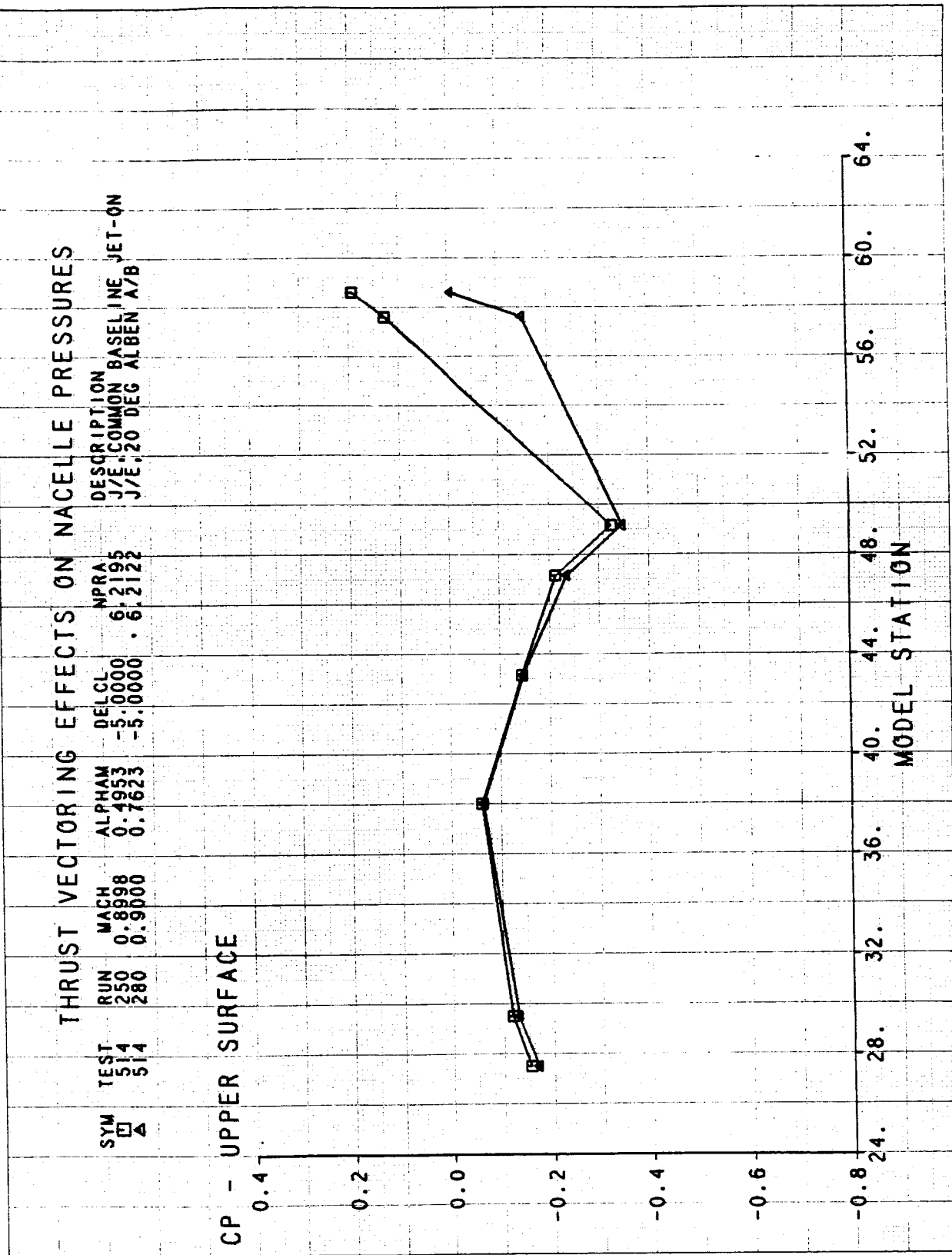
# THRUST VECTORING EFFECTS ON INNER WING PRESSURES

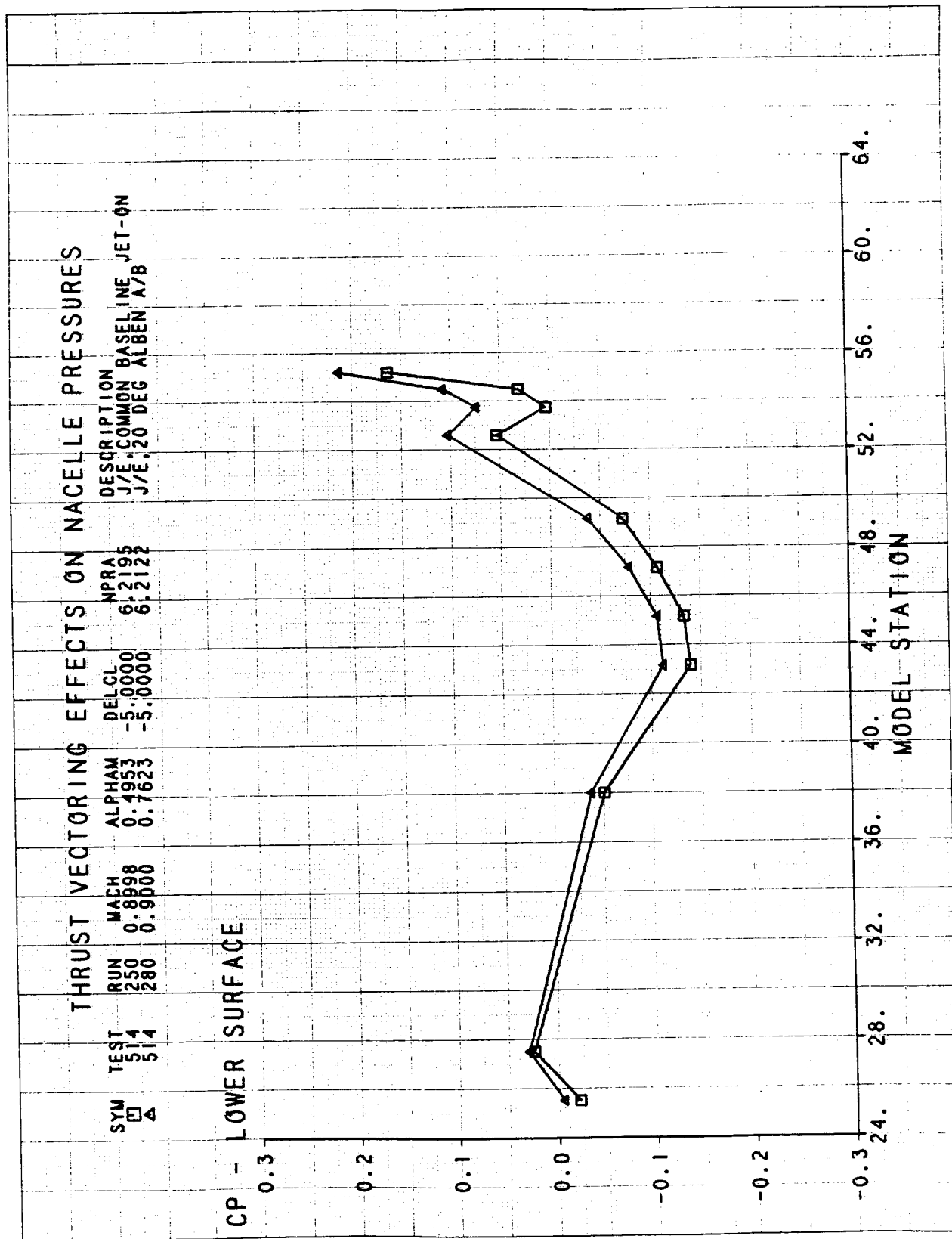
SYM	TEST	RUN	MACH	ALPHAM	DELCL	NPRA	DESCRIPTION
□	514	260	0.6012	0.6526	-5.0000	4.2160	J/E, COMMON BASELINE, JET-ON
△	514	269	0.6010	0.7098	-5.0000	4.2045	J/E, 20 DEG ALBEN A/B

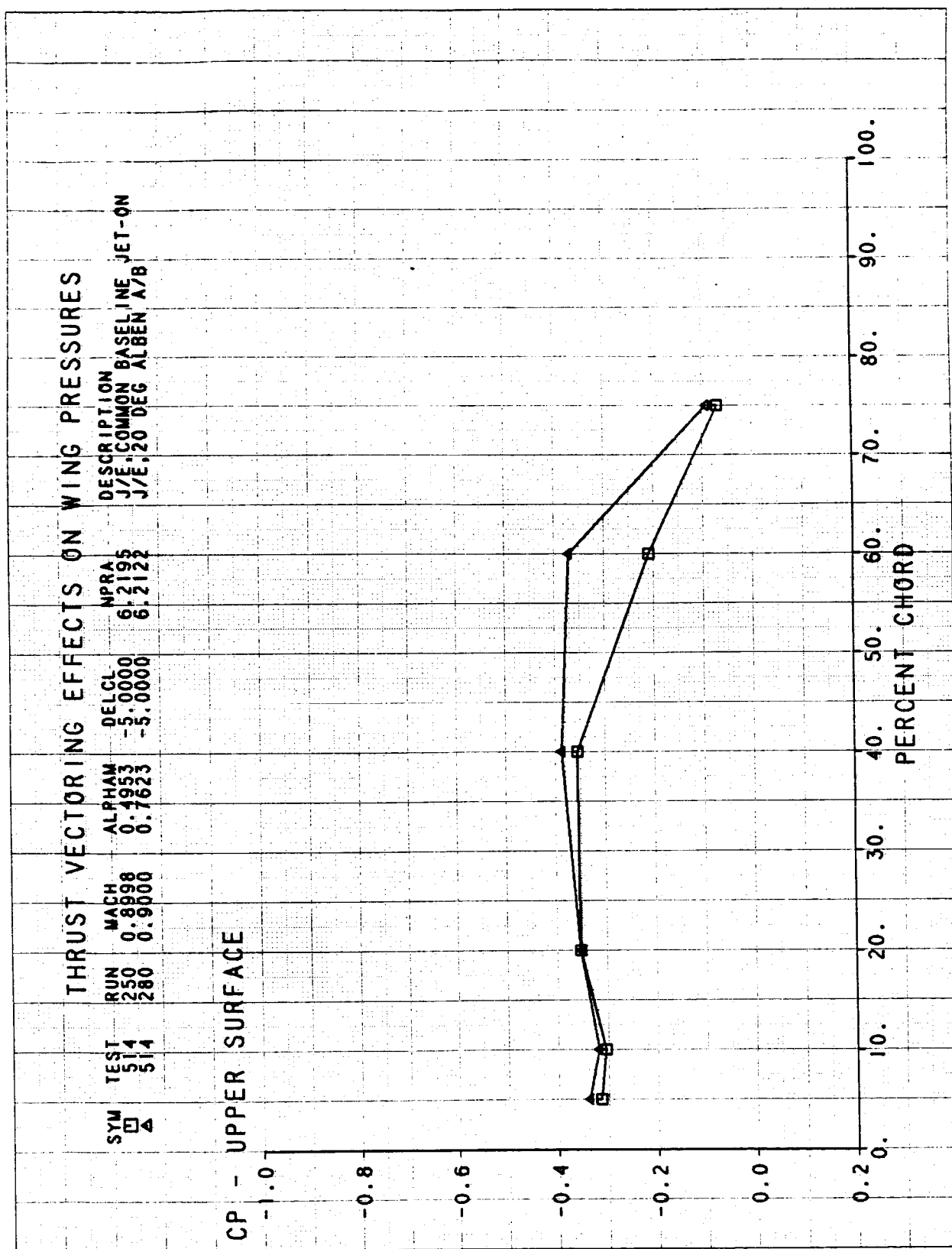
CP - UPPER SURFACE







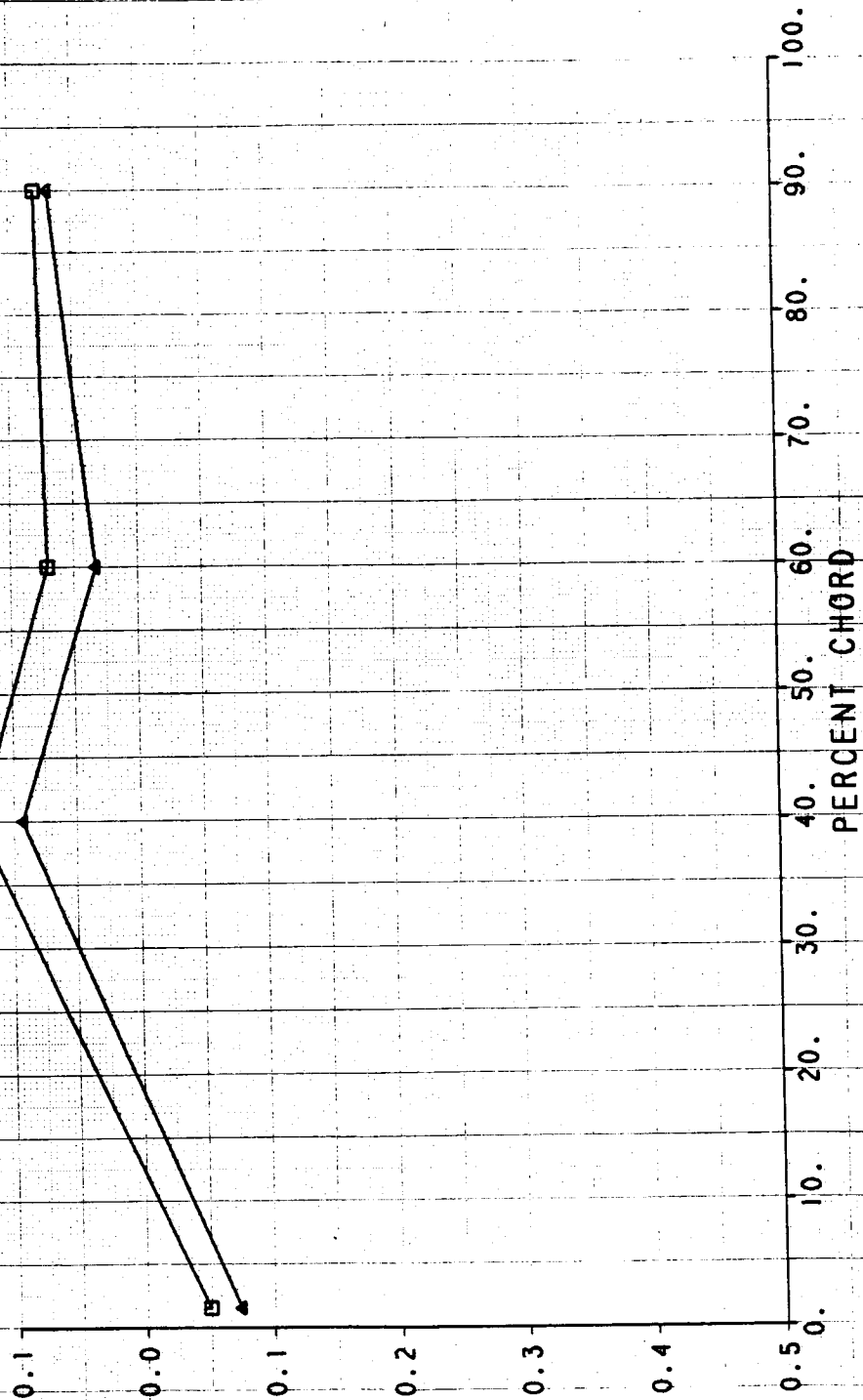


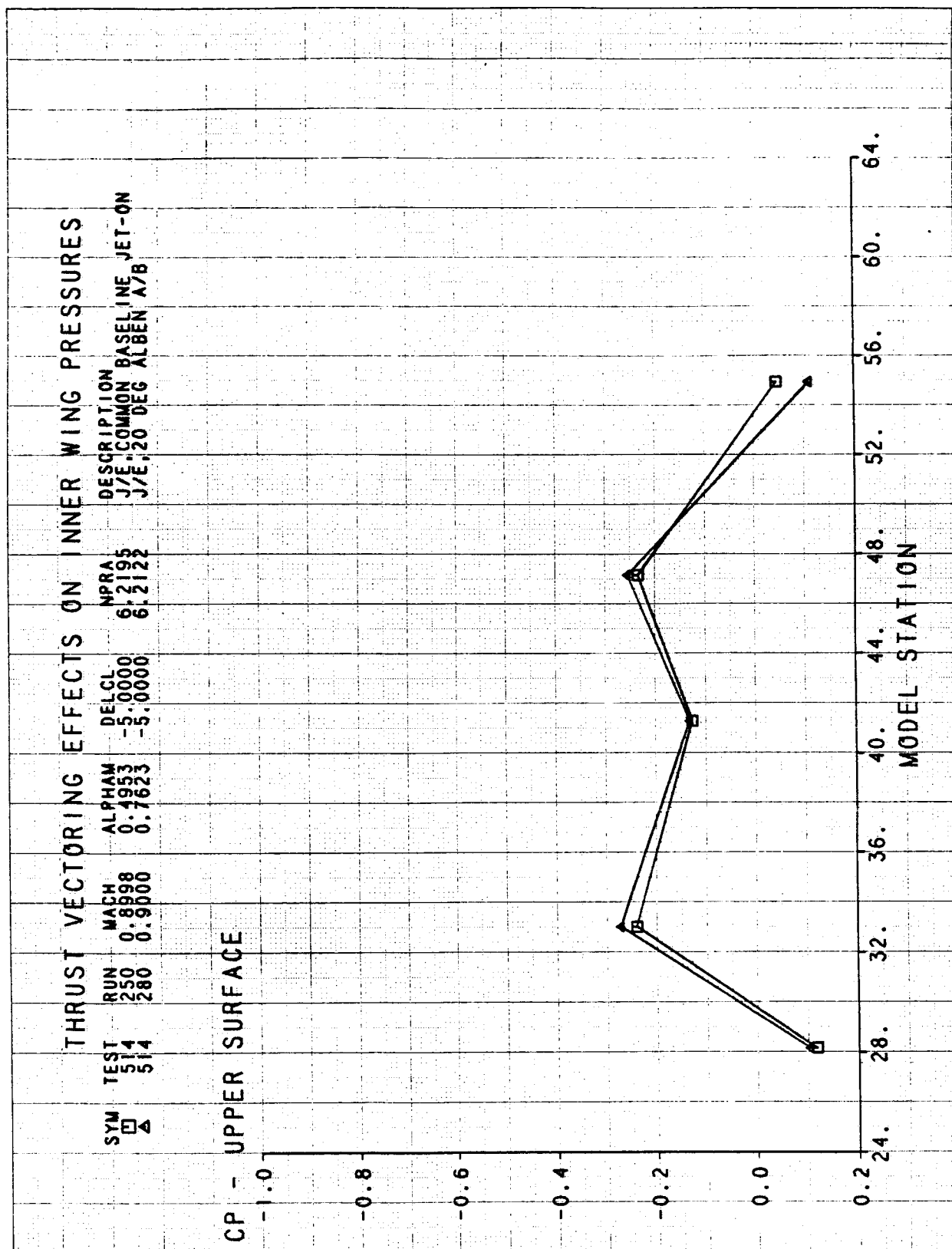


# THRUST VECTORING EFFECTS ON WING PRESSURES

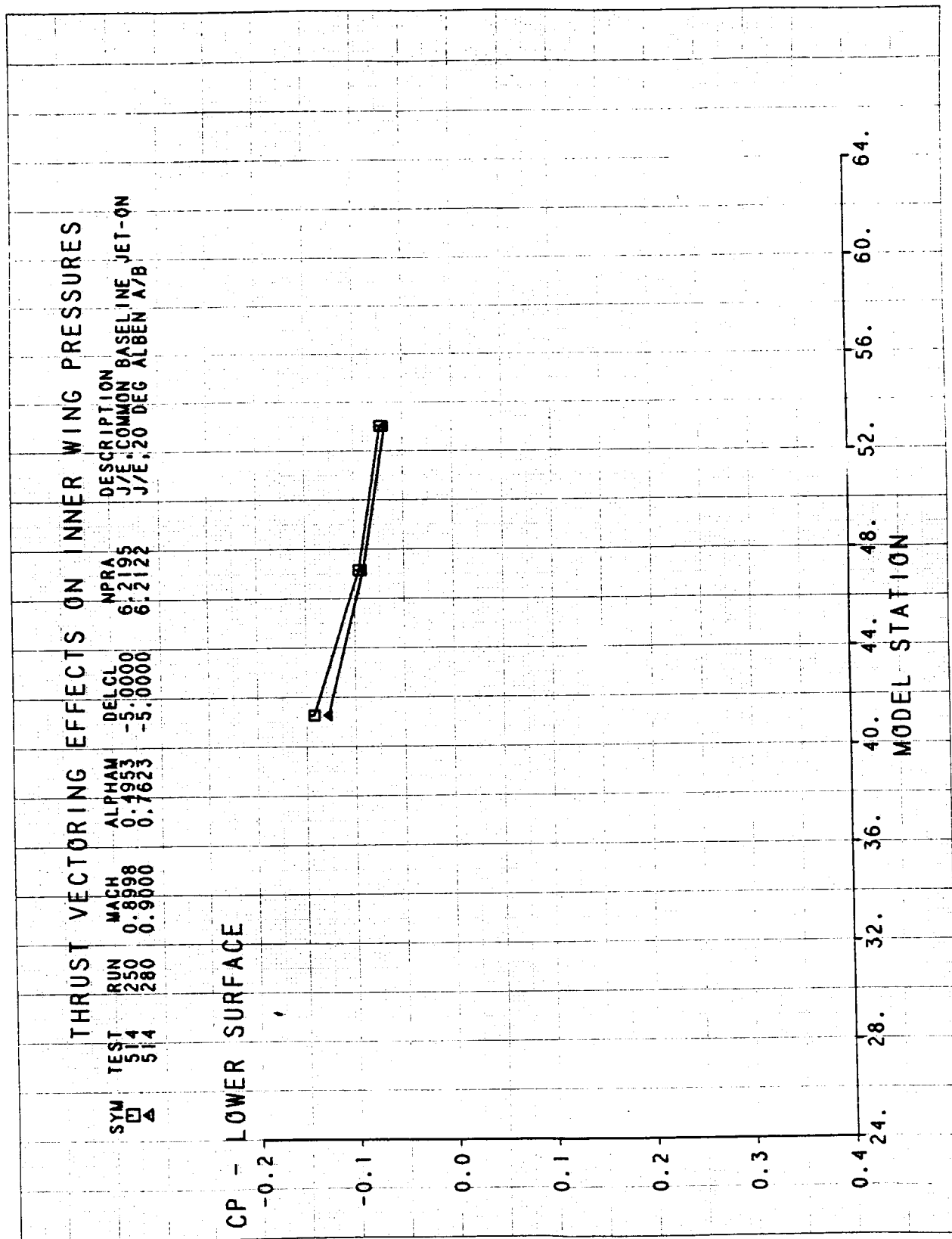
SYM	TEST	RUN	MACH	ALPHAM	DELCL	NPRA	DESCRIPTION
□	514	250	0.8998	0.4953	-5.0000	6.2195	J/E, COMMON BASELINE, JET-ON
△	514	280	0.9000	0.7623	-5.0000	6.2122	J/E, 20 DEG ALBEN A/B

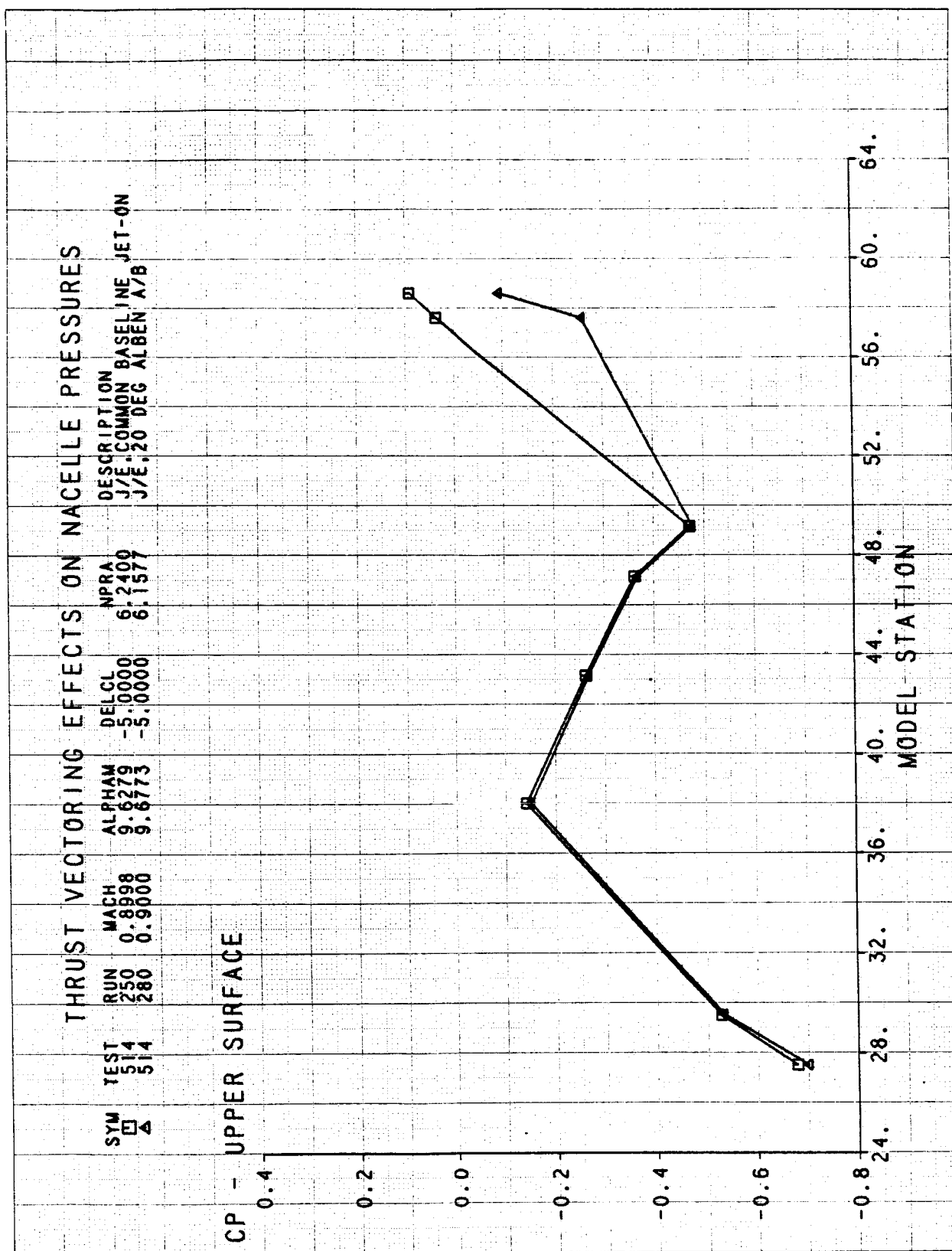
CP - LOWER SURFACE



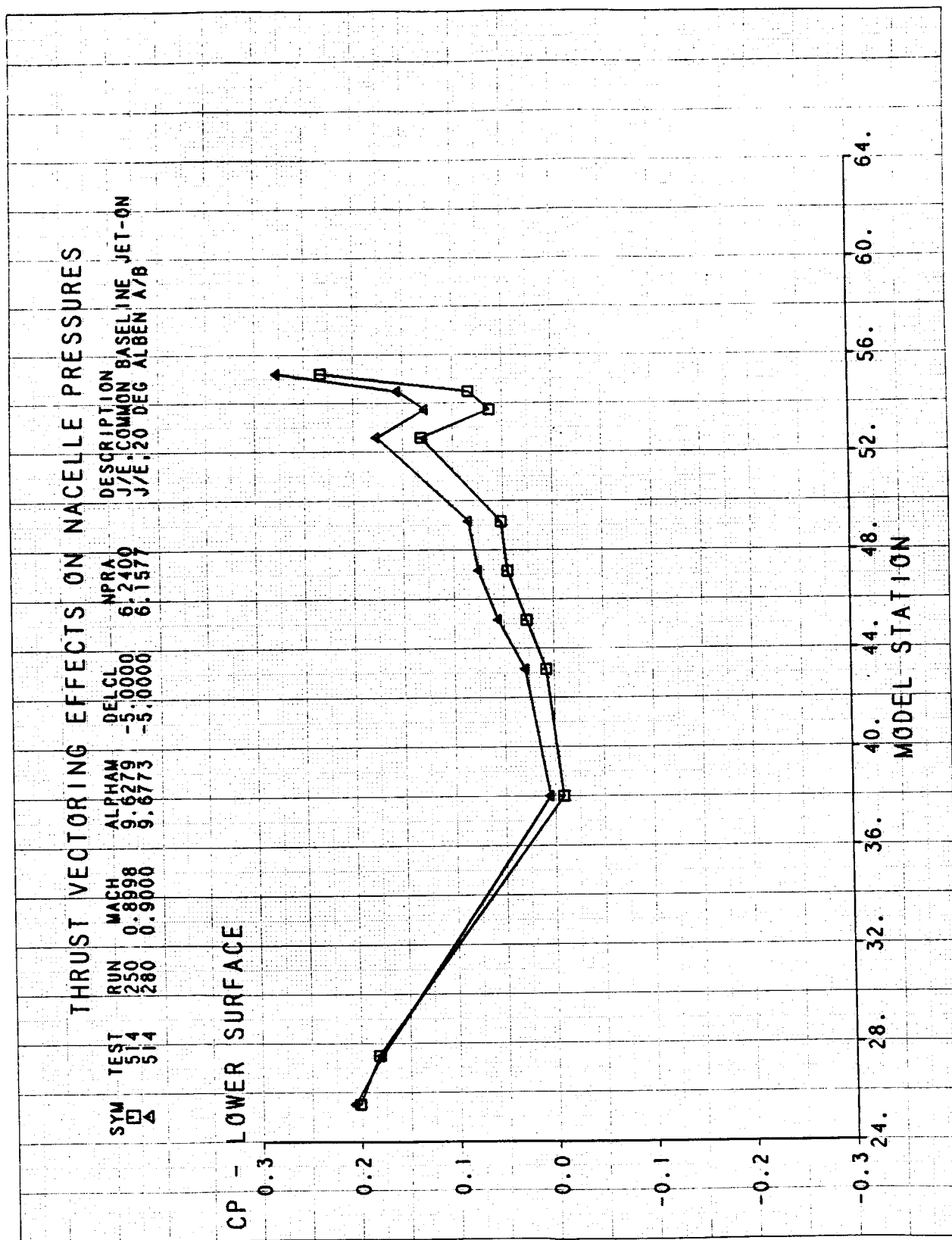


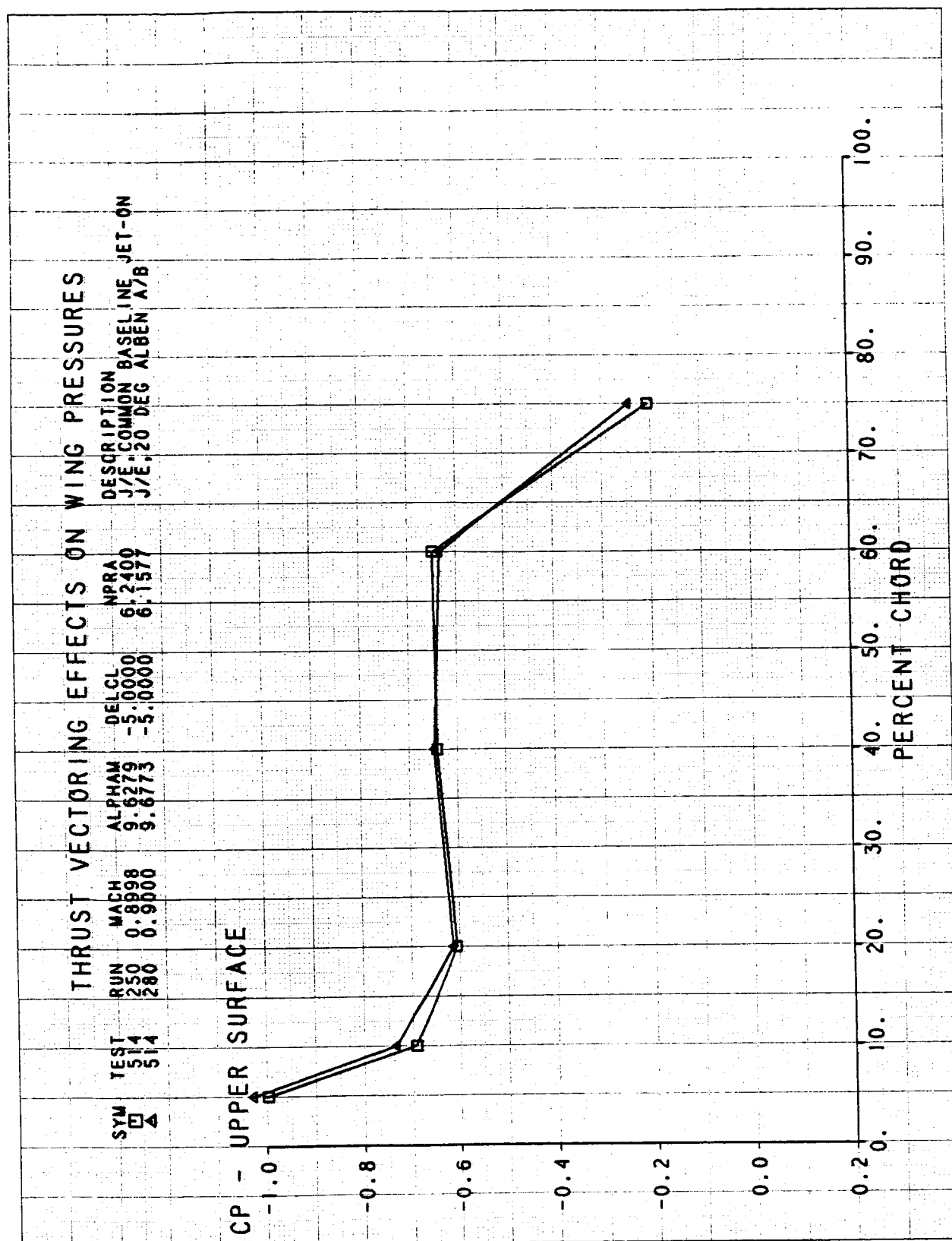


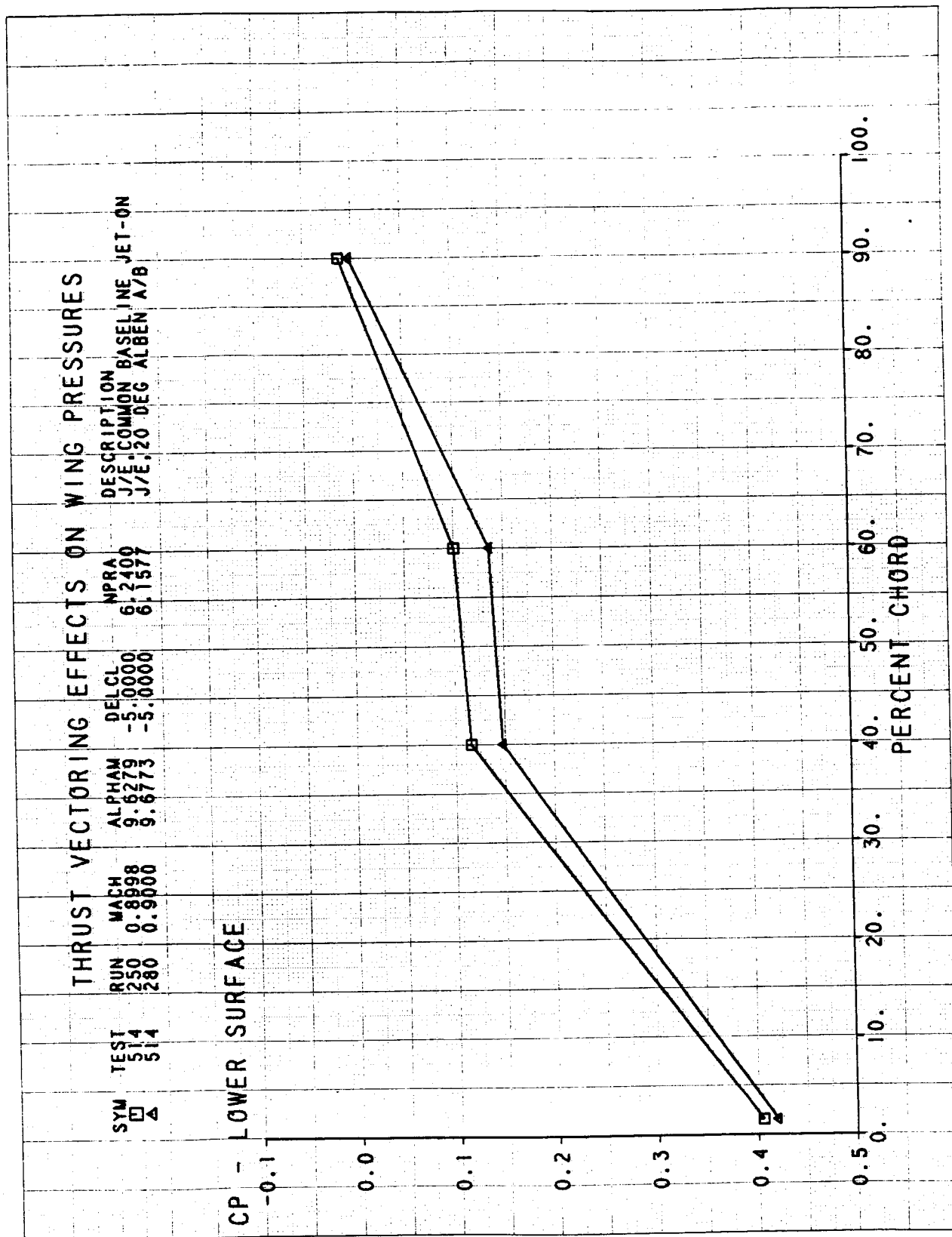


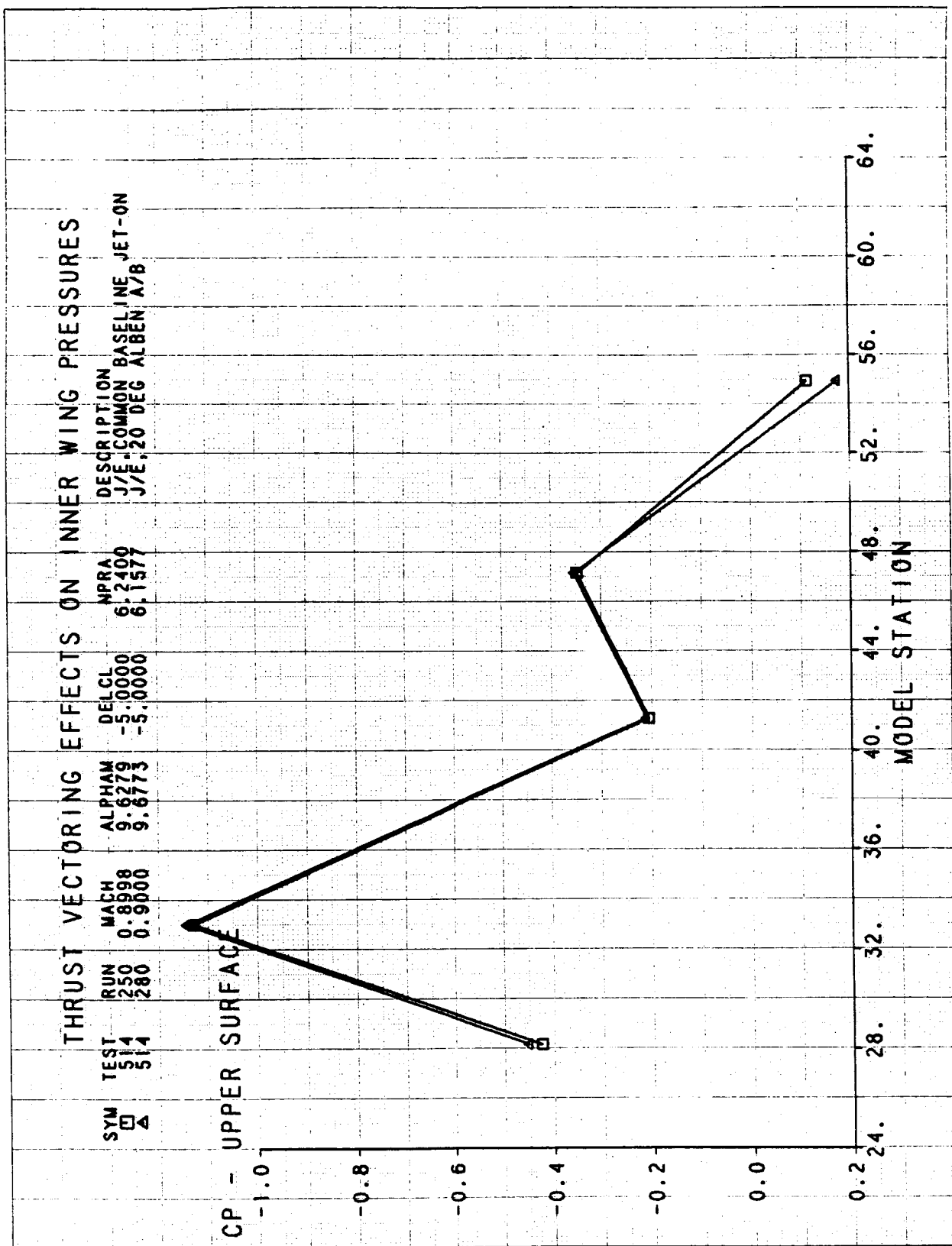


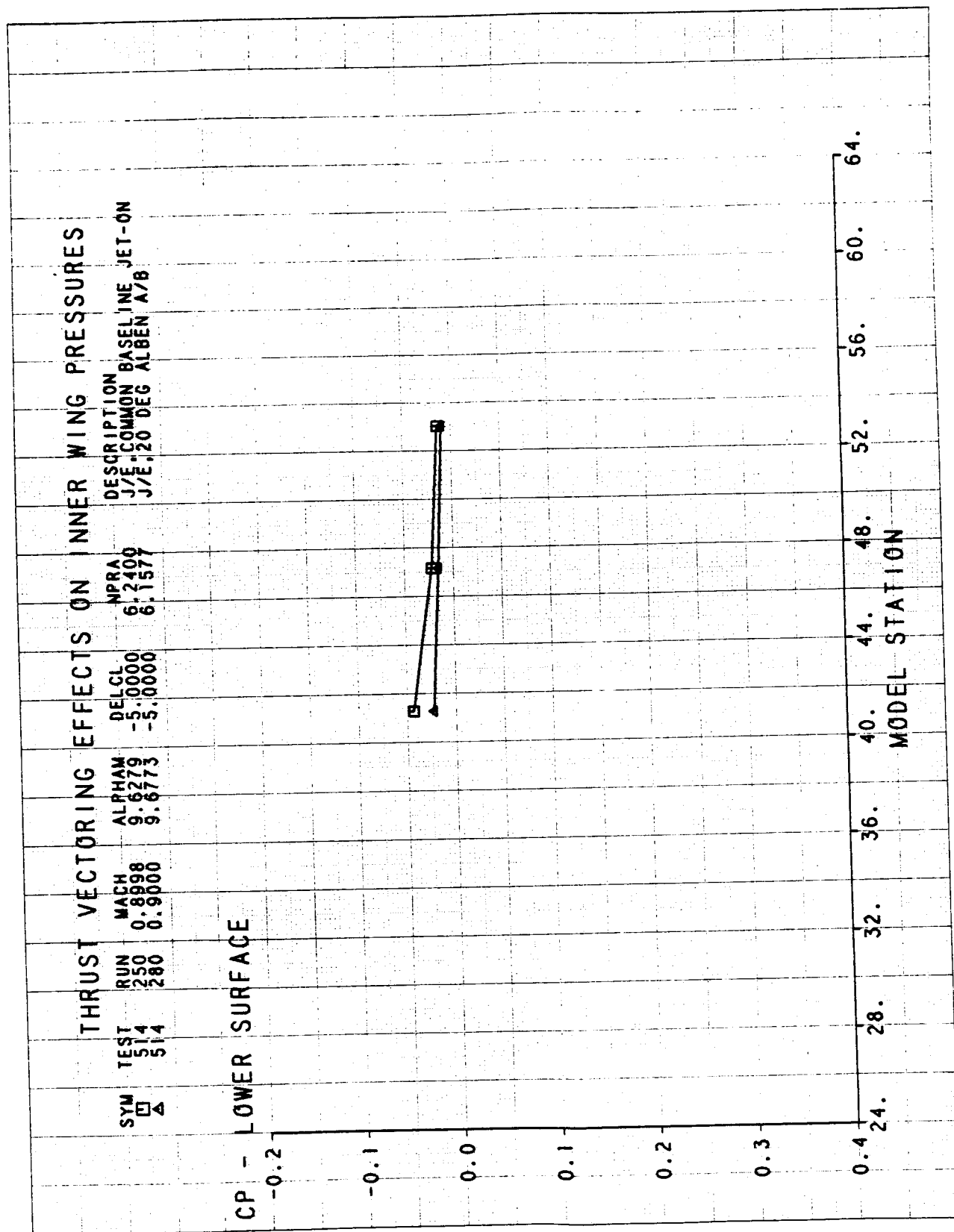
ORIGINAL PAGE IS  
OF POOR QUALITY

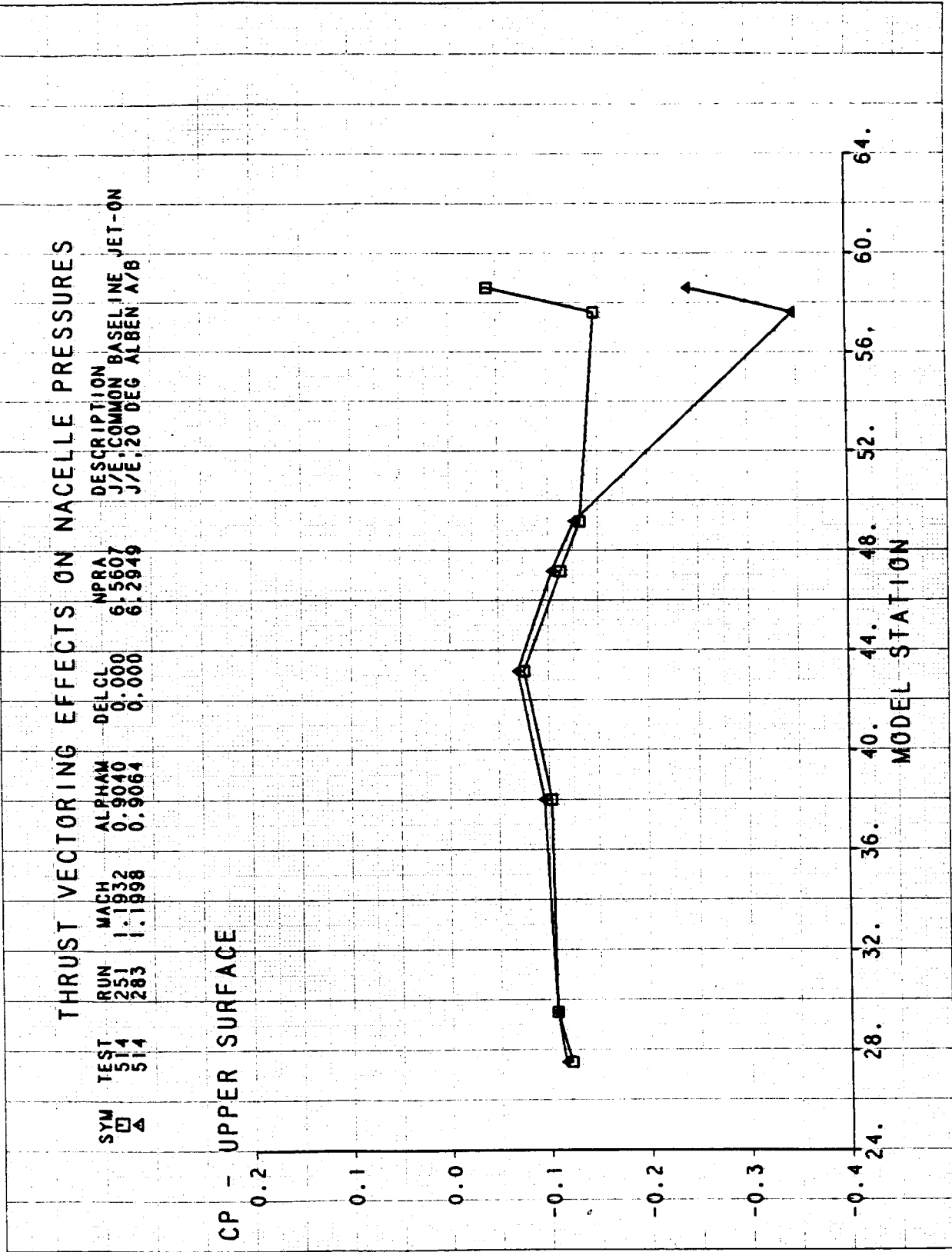




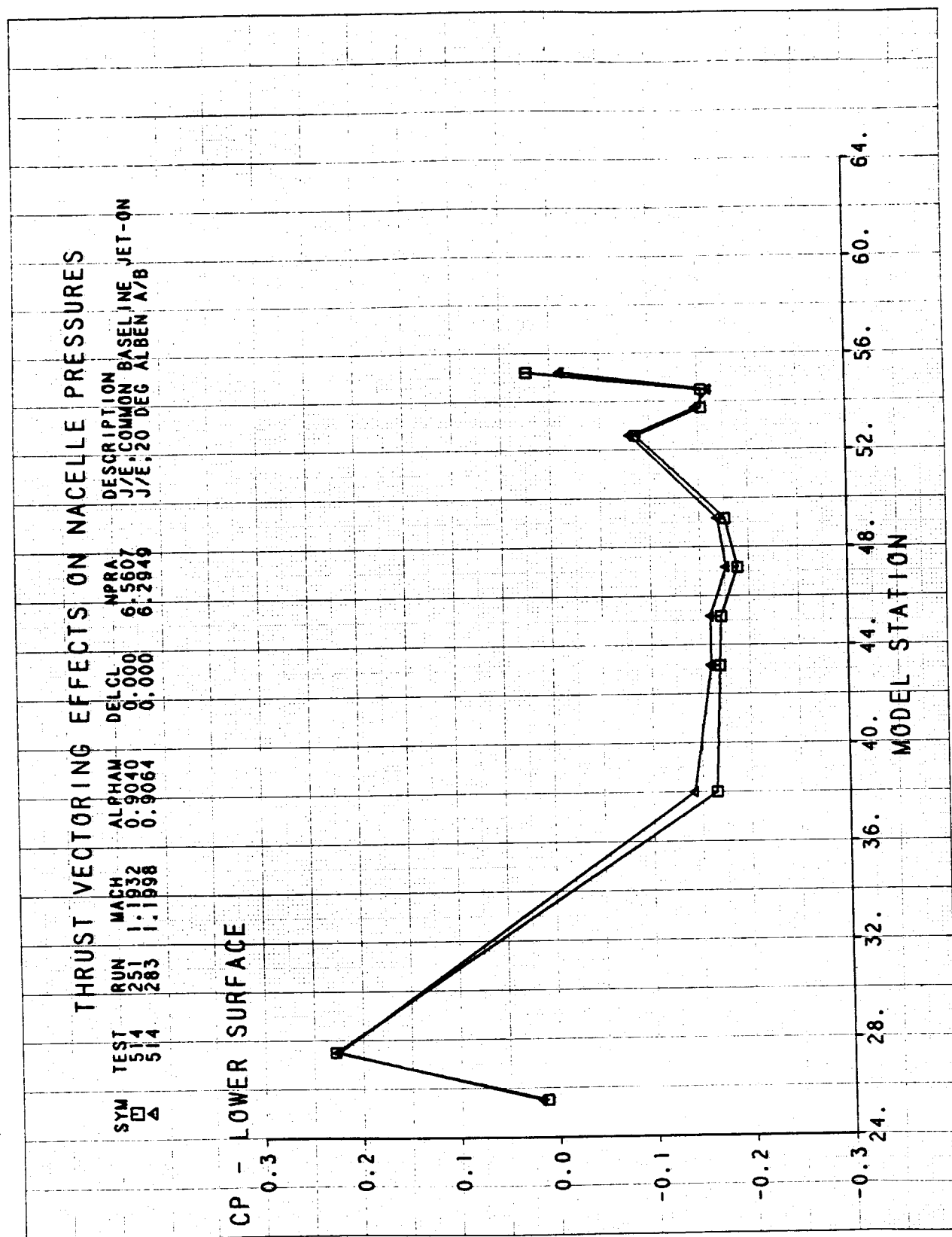


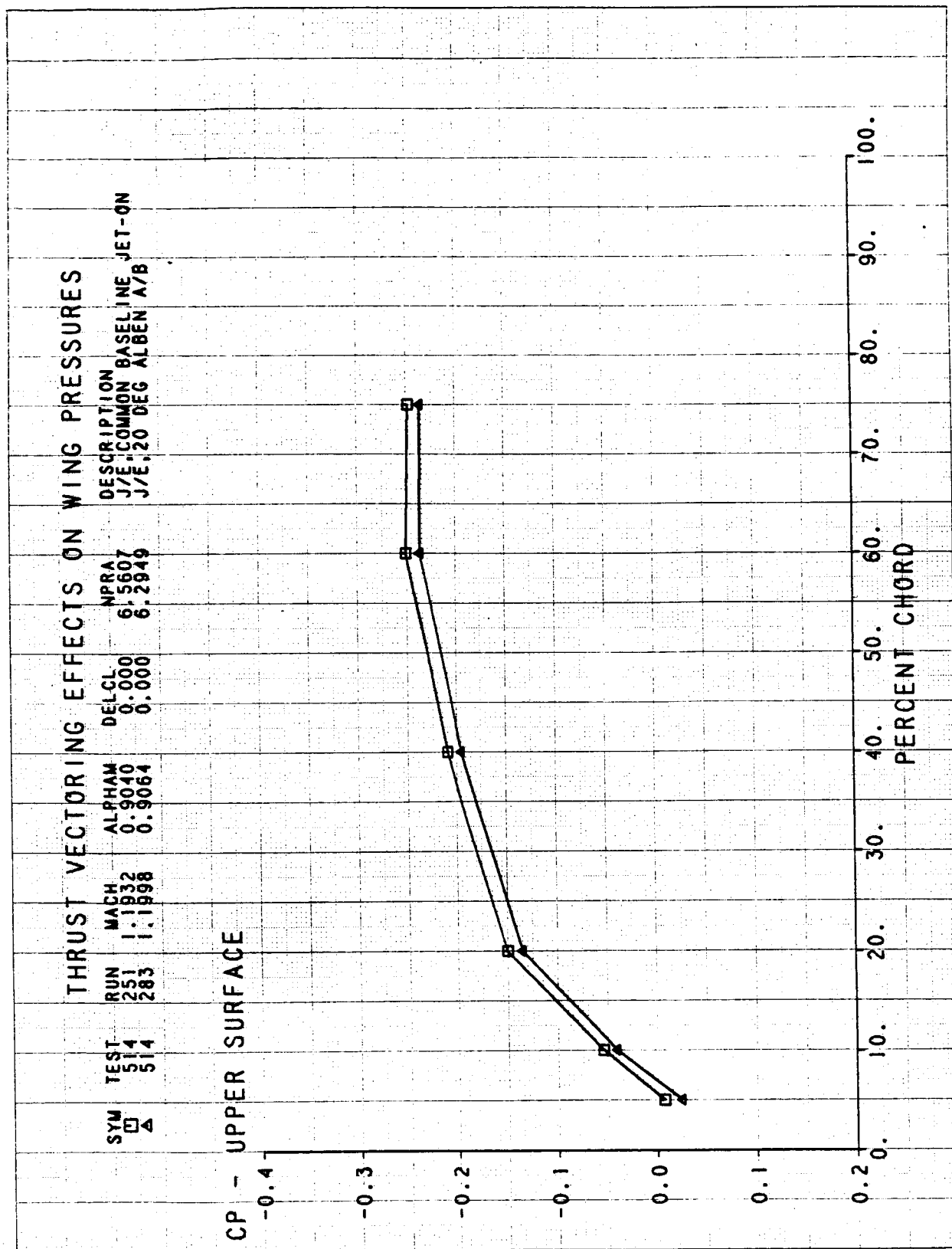


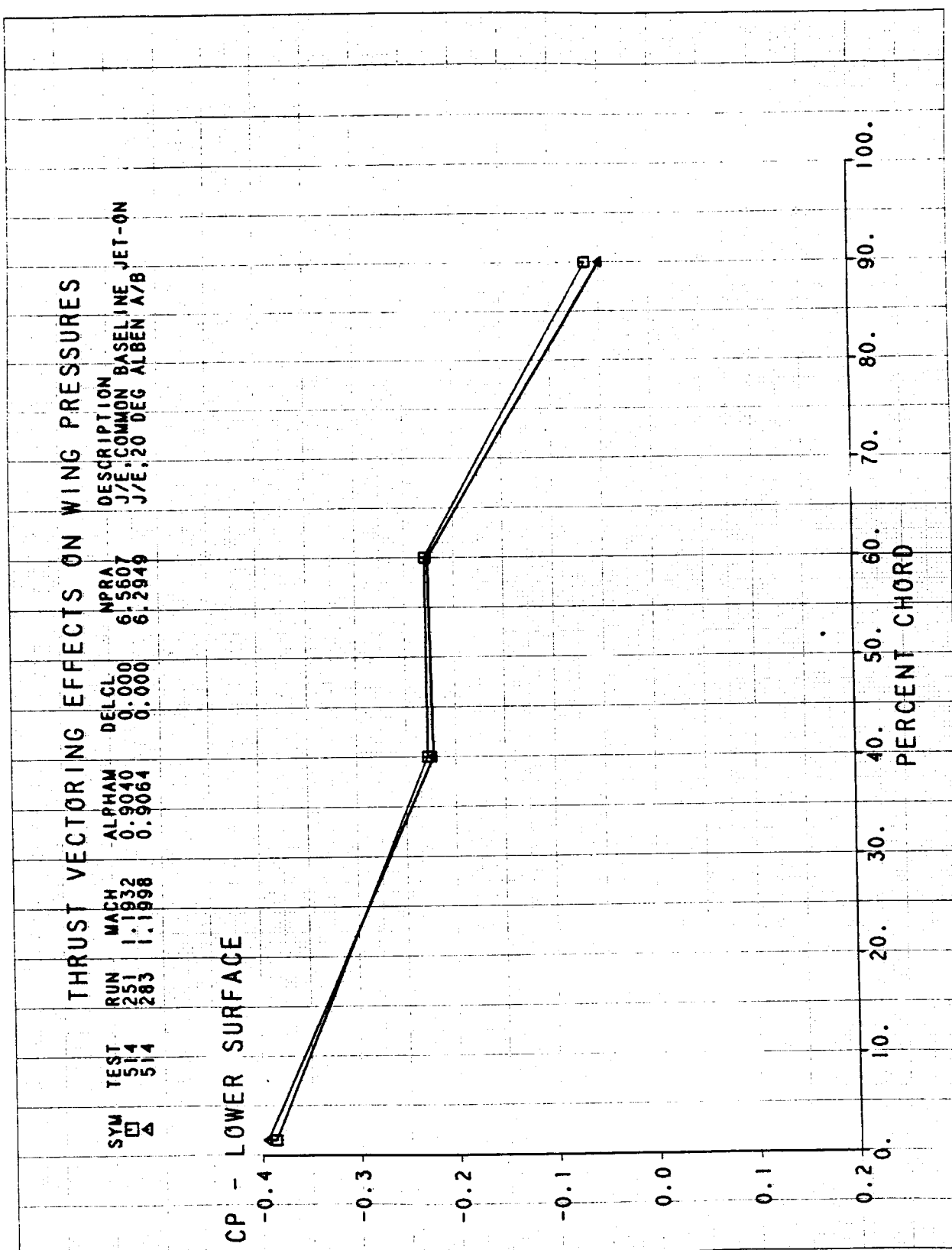




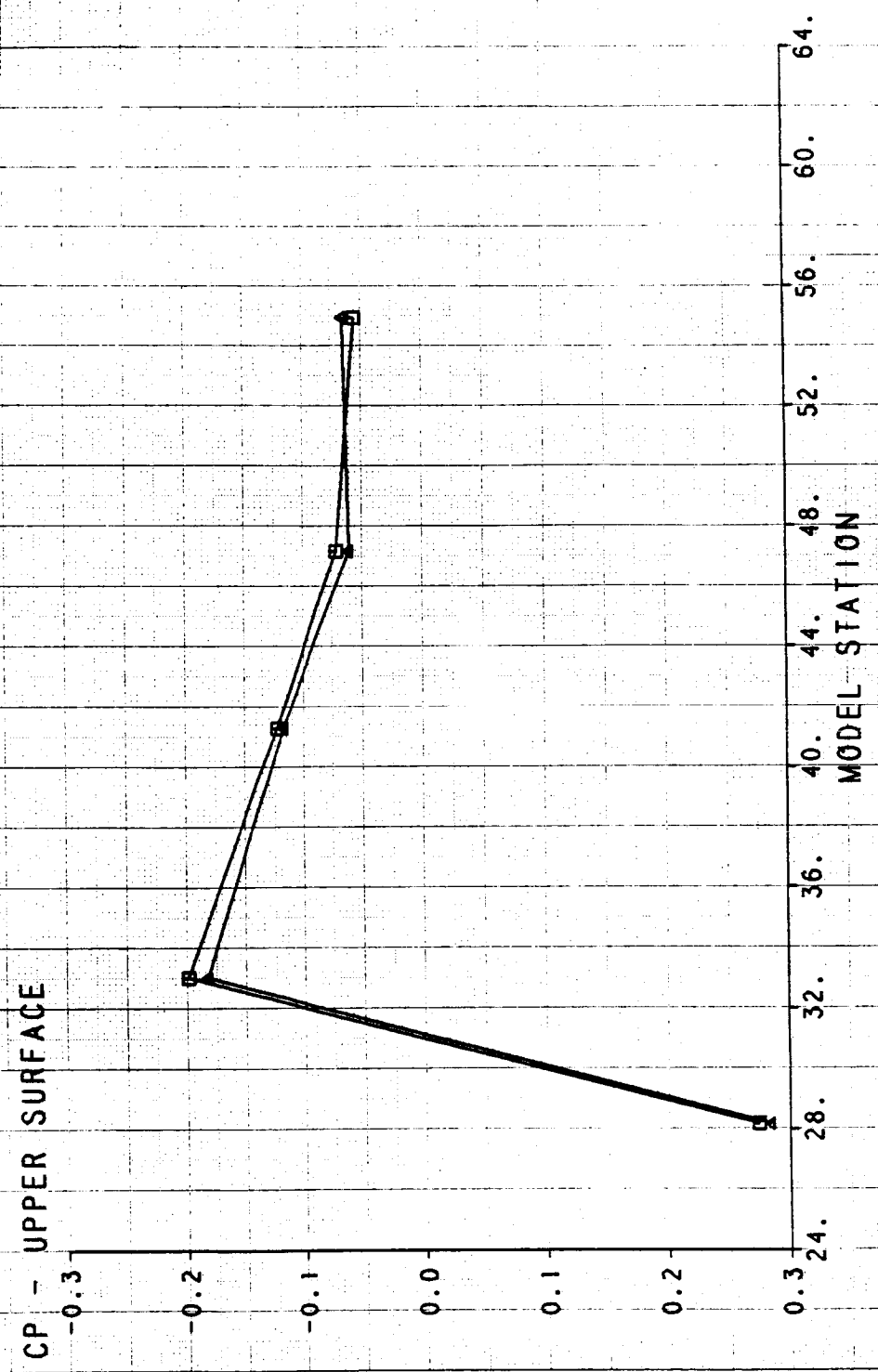


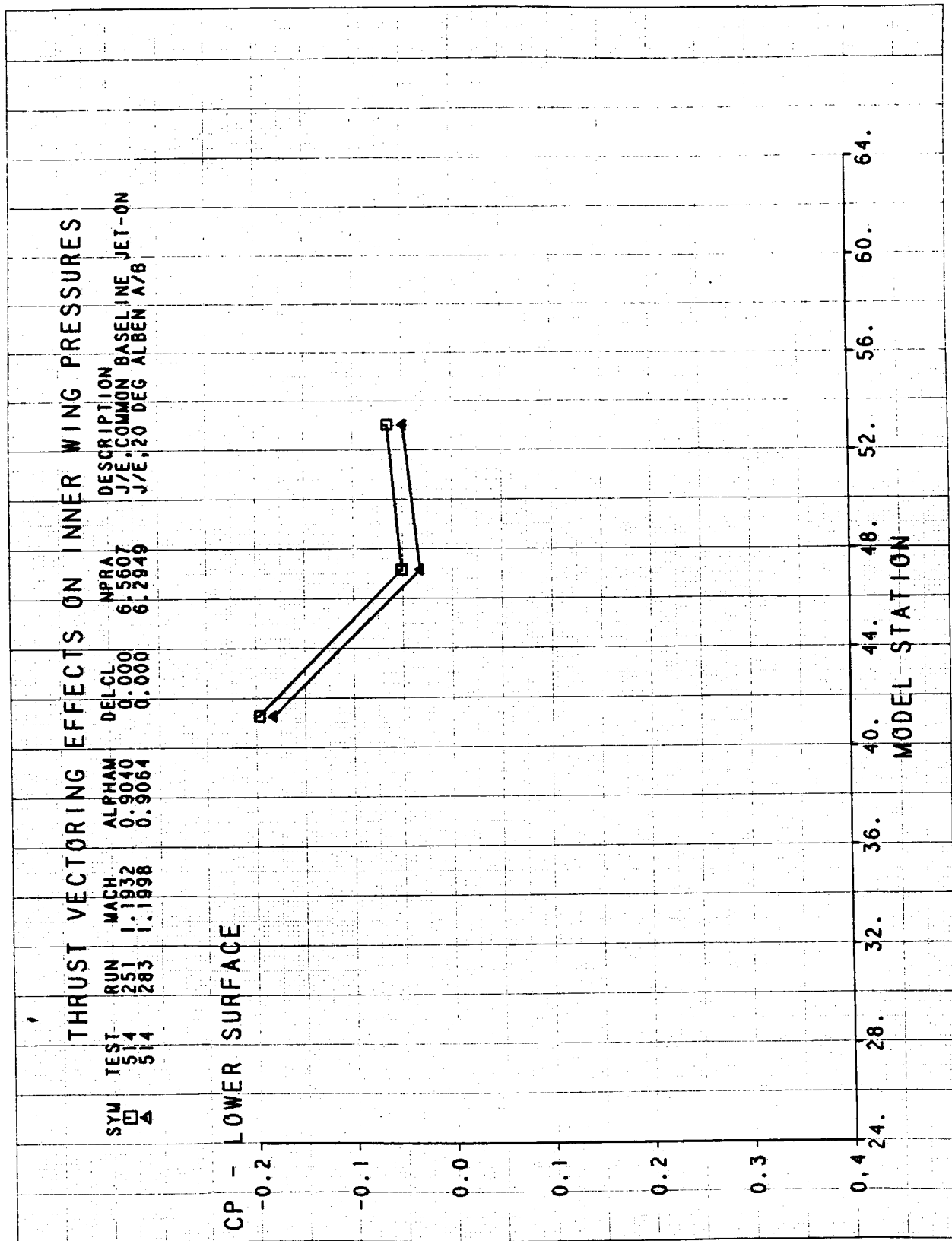


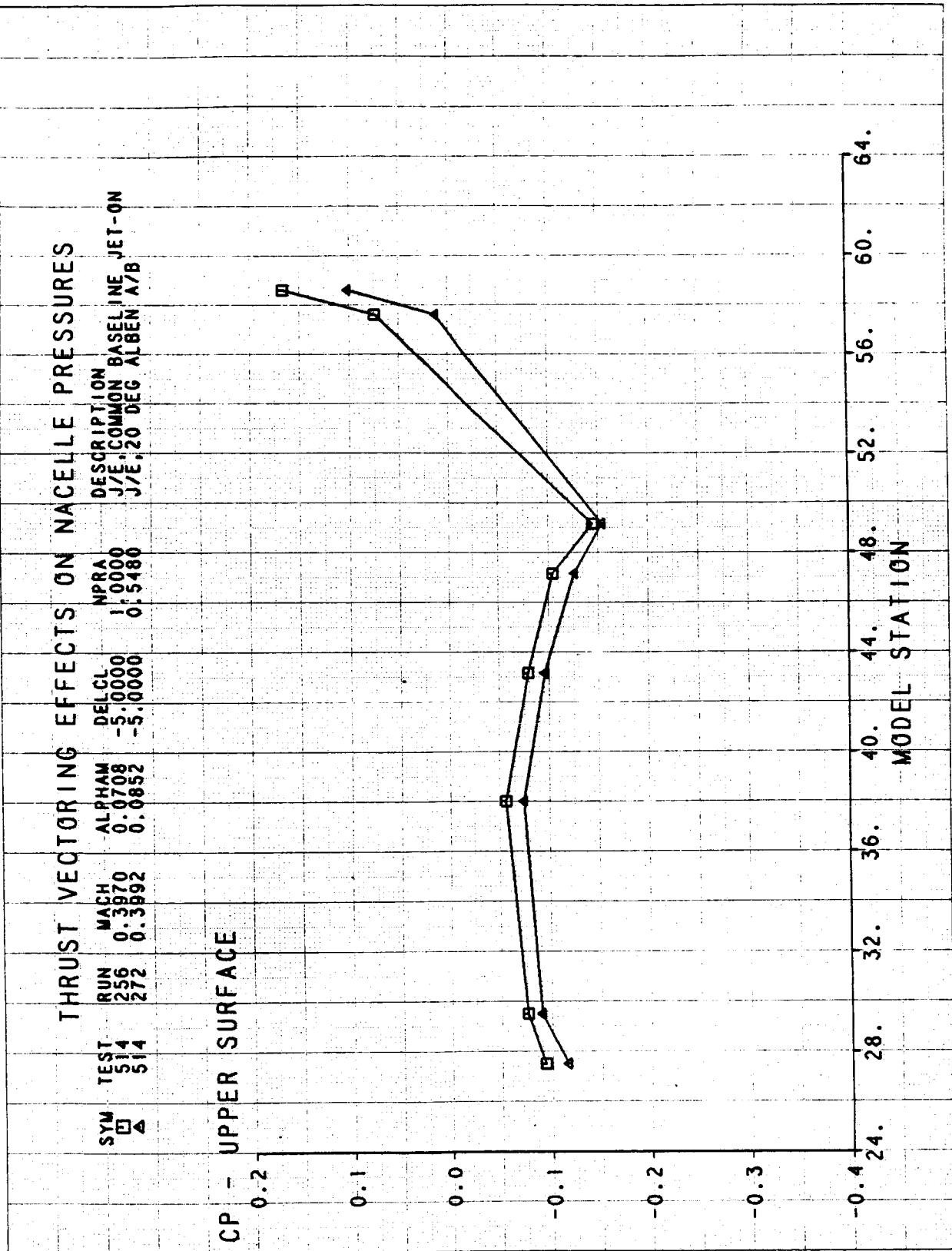


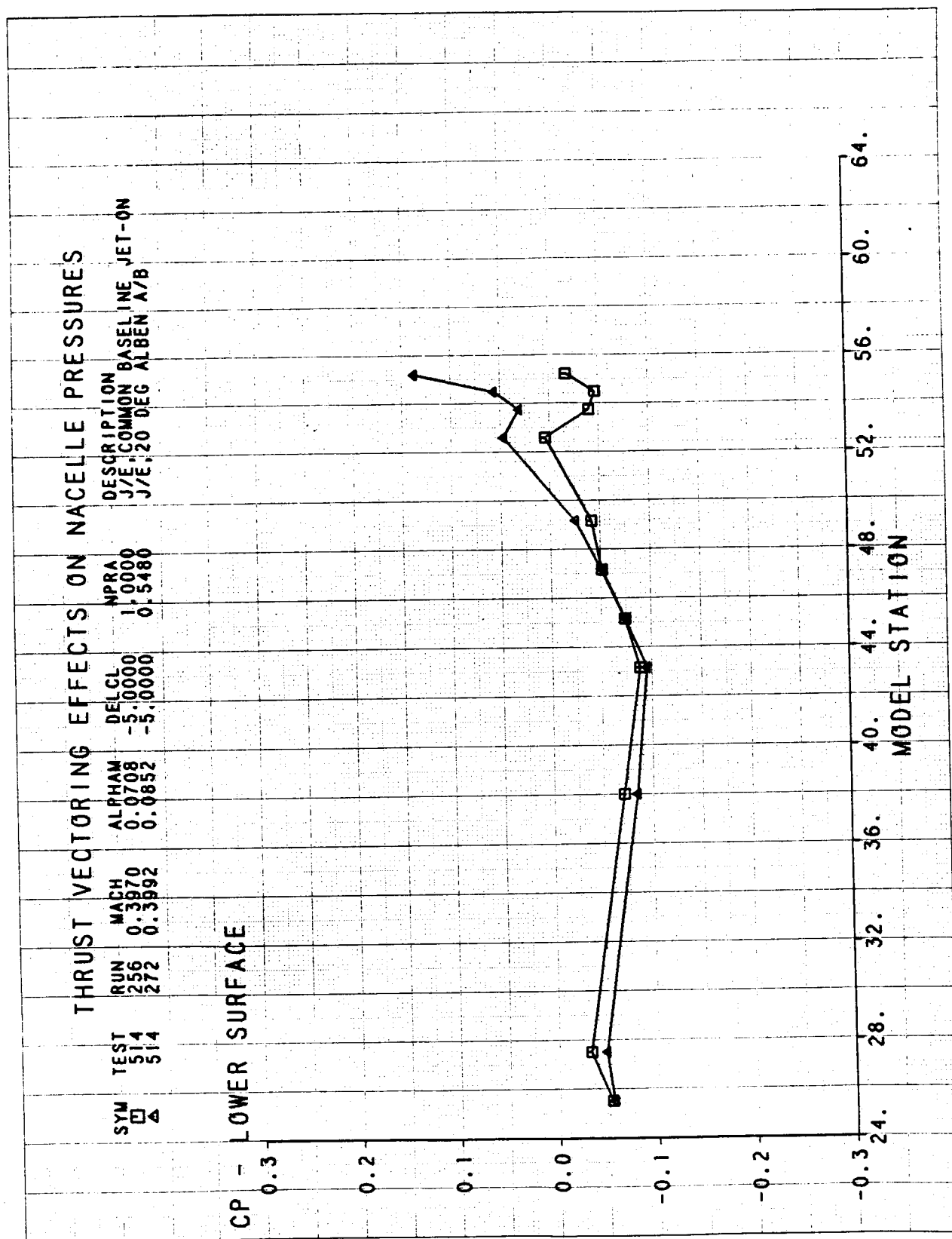


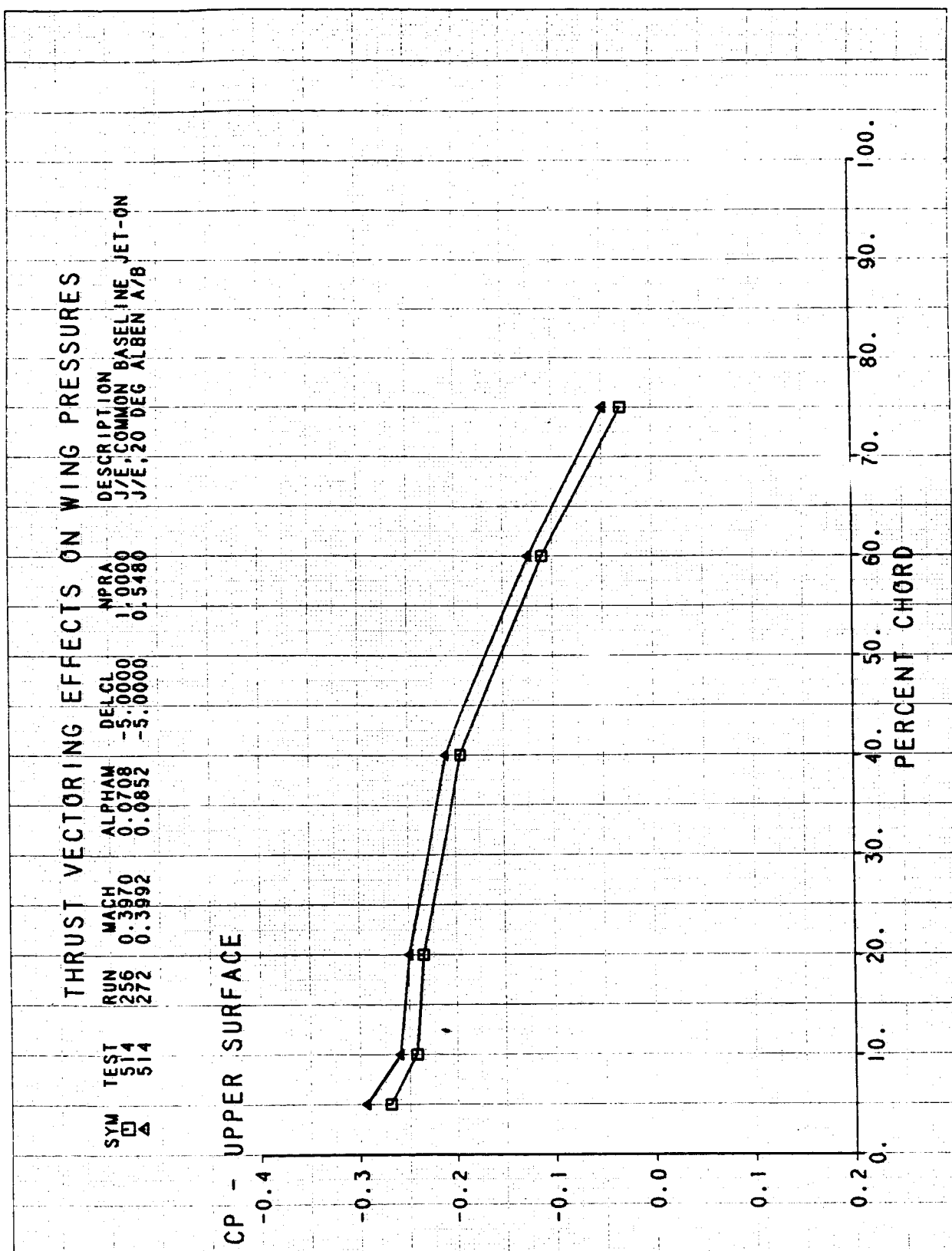
THRUST VECTORING EFFECTS ON INNER WING PRESSURES  
 SYM TEST RUN MACH ALPHAM DELCL NPRA DESCRIPTION  
 514 251 1.1932 0.9040 0.000 6.5607 J/E. COMMON BASELINE JET-ON  
 514 283 1.1998 0.9064 0.000 6.2949 J/E. 20 DEG ALBEN A/B



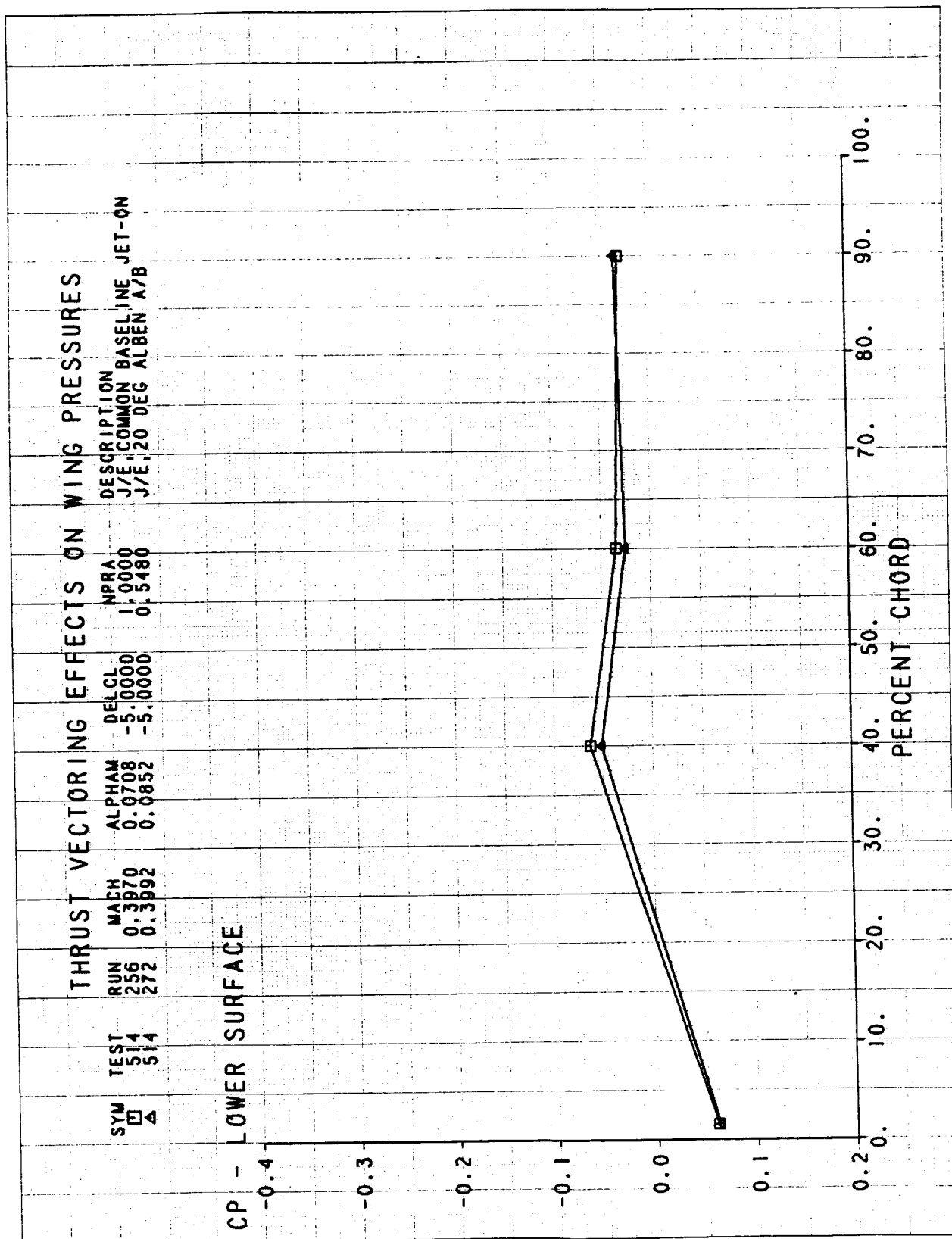








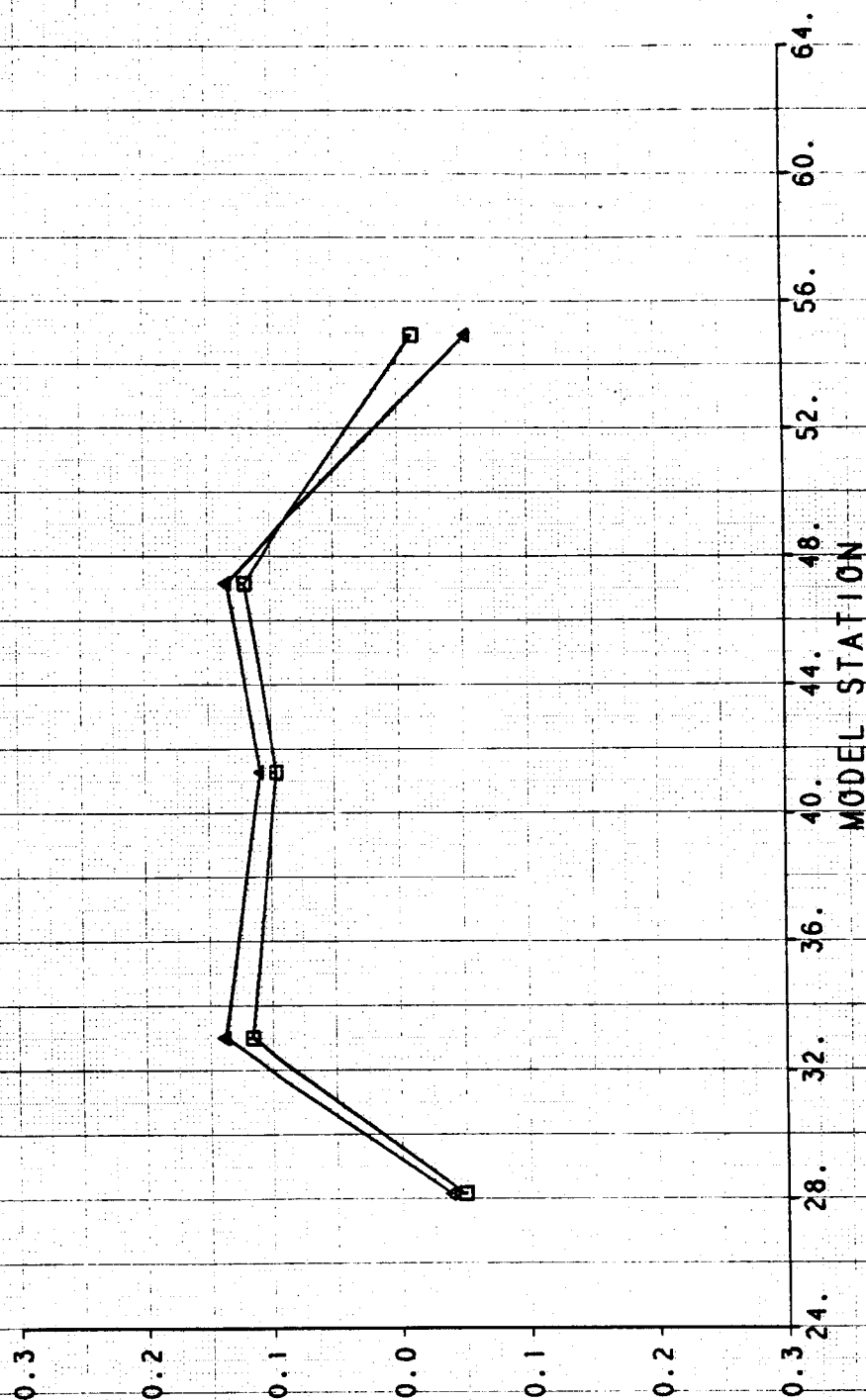


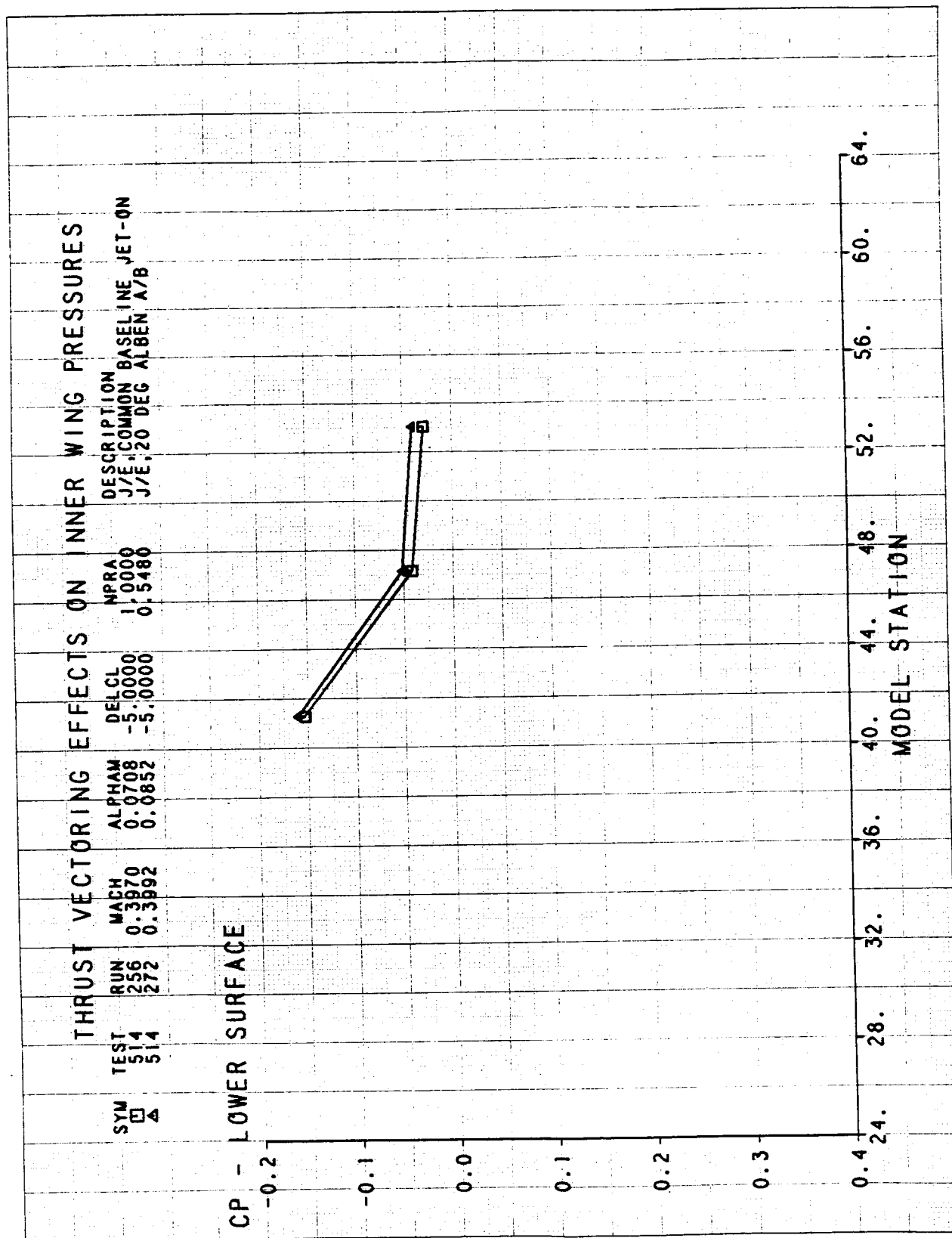


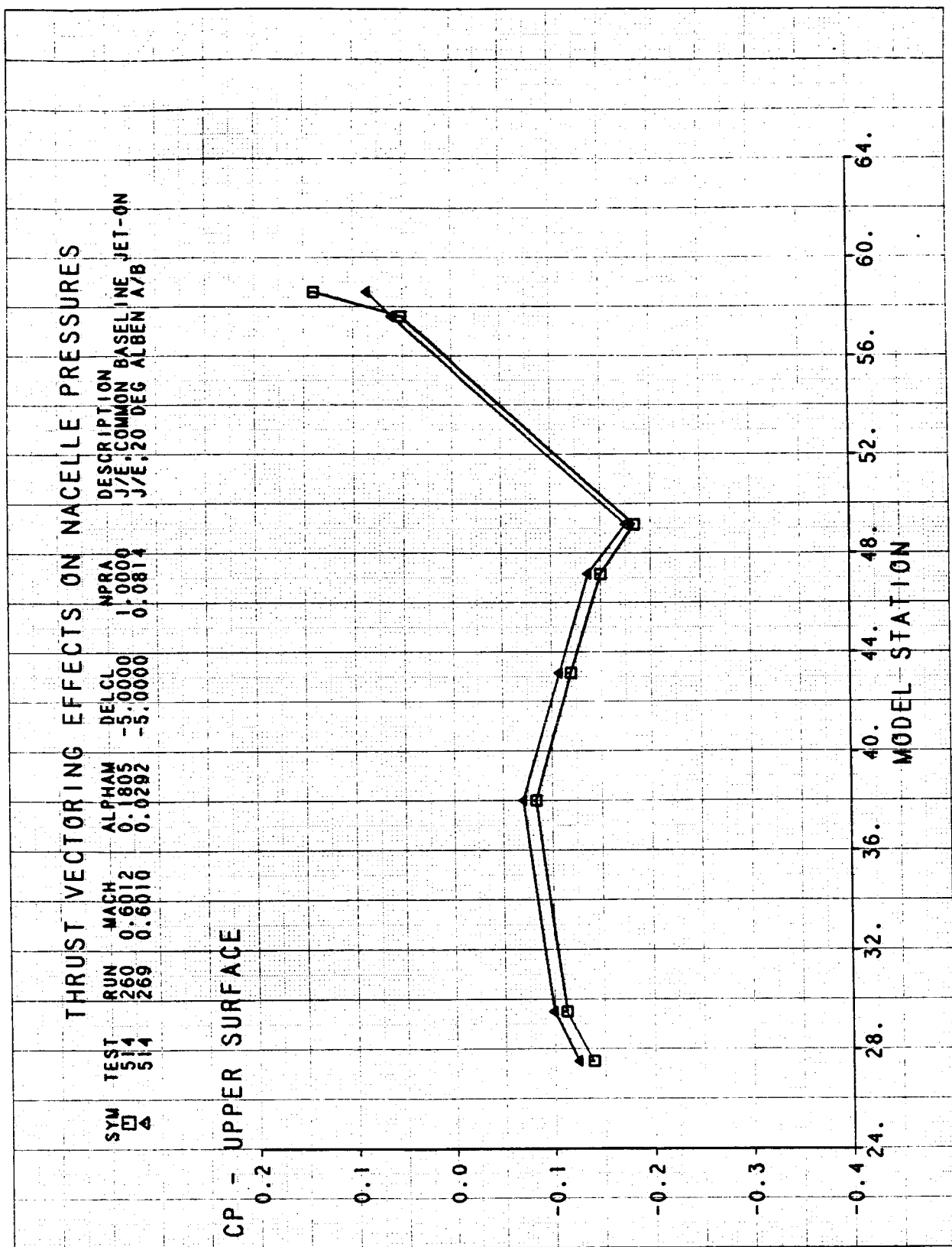
# THRUST VECTORING EFFECTS ON INNER WING PRESSURES

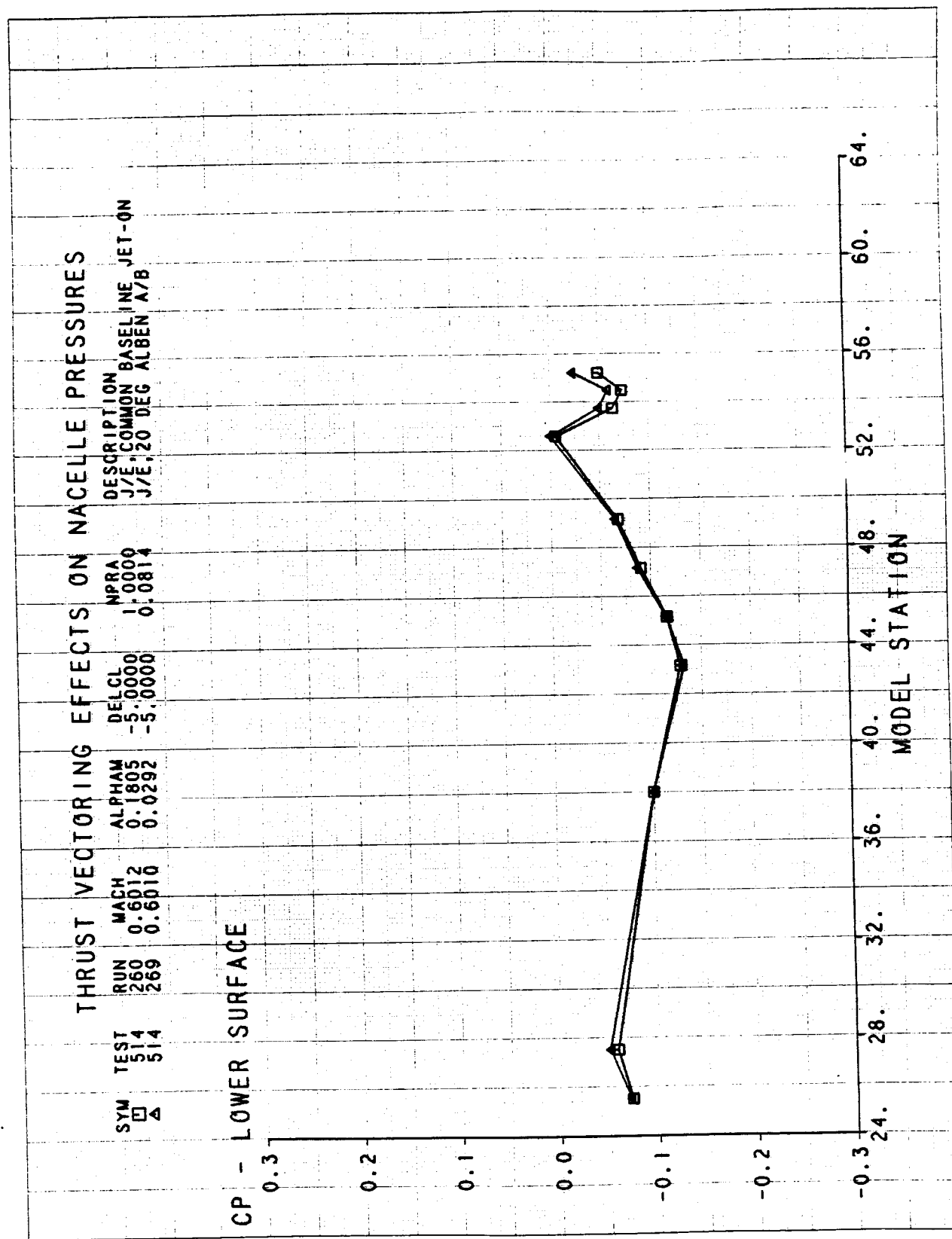
SYM	TEST	RUN	MACH	ALPHAM	DELCL	MPRA	DESCRIPTION
□	514	256	0.3970	0.0708	-5.0000	1.0000	J/E, COMMON BASELINE, JET-QN
△	514	272	0.3992	0.0852	-5.0000	0.5480	J/E, 20 DEG ALBEN A/B

CP - UPPER SURFACE





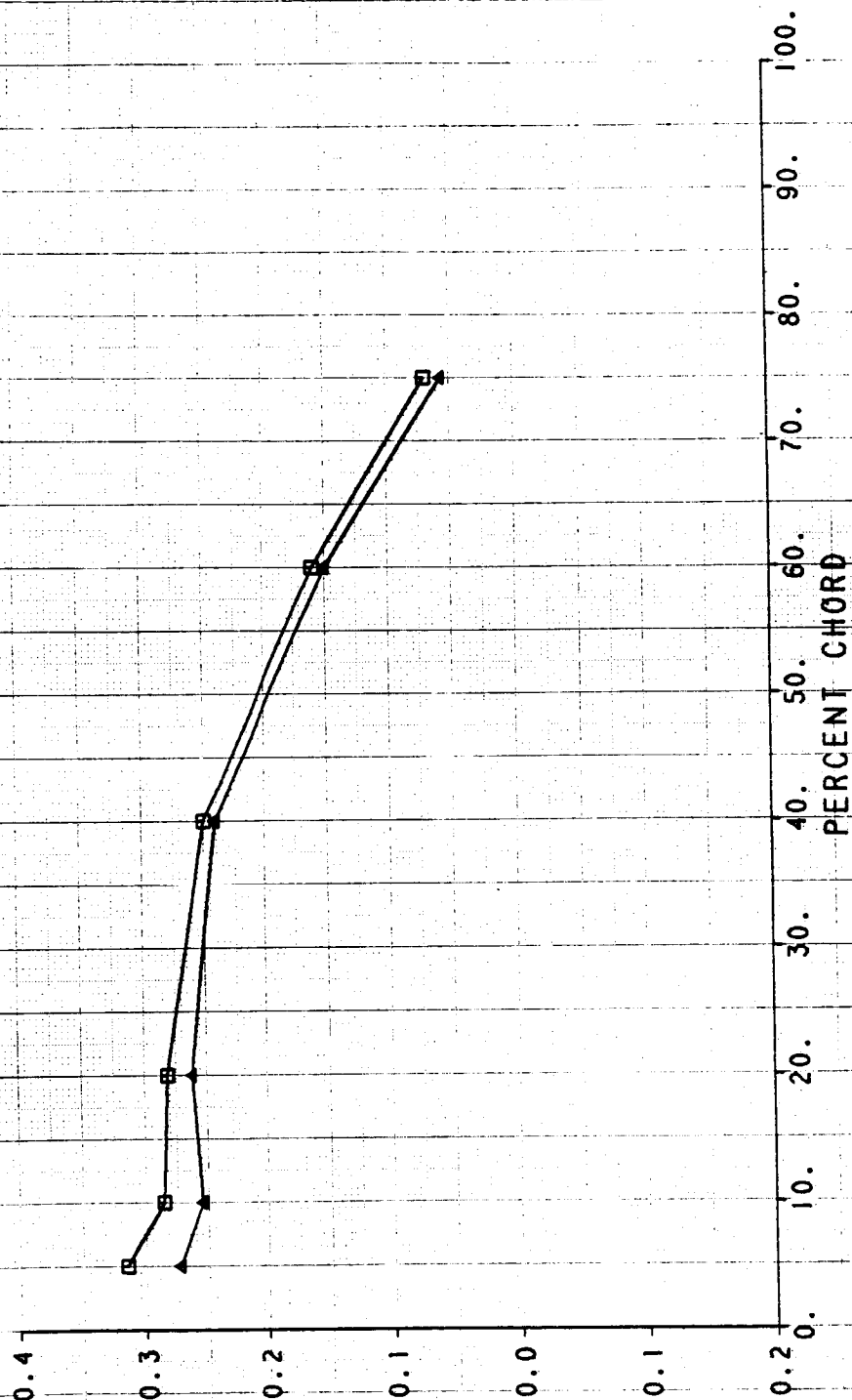


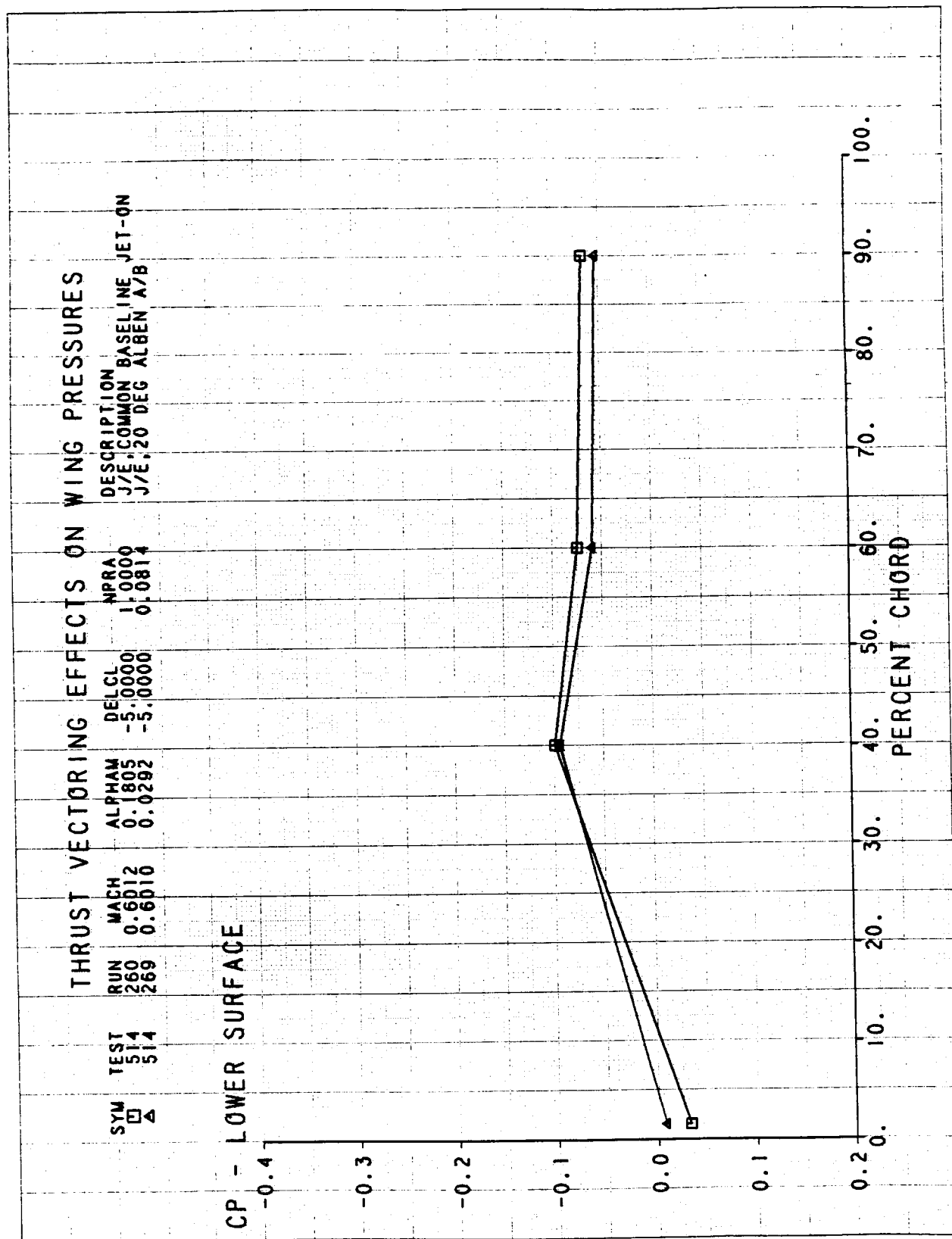


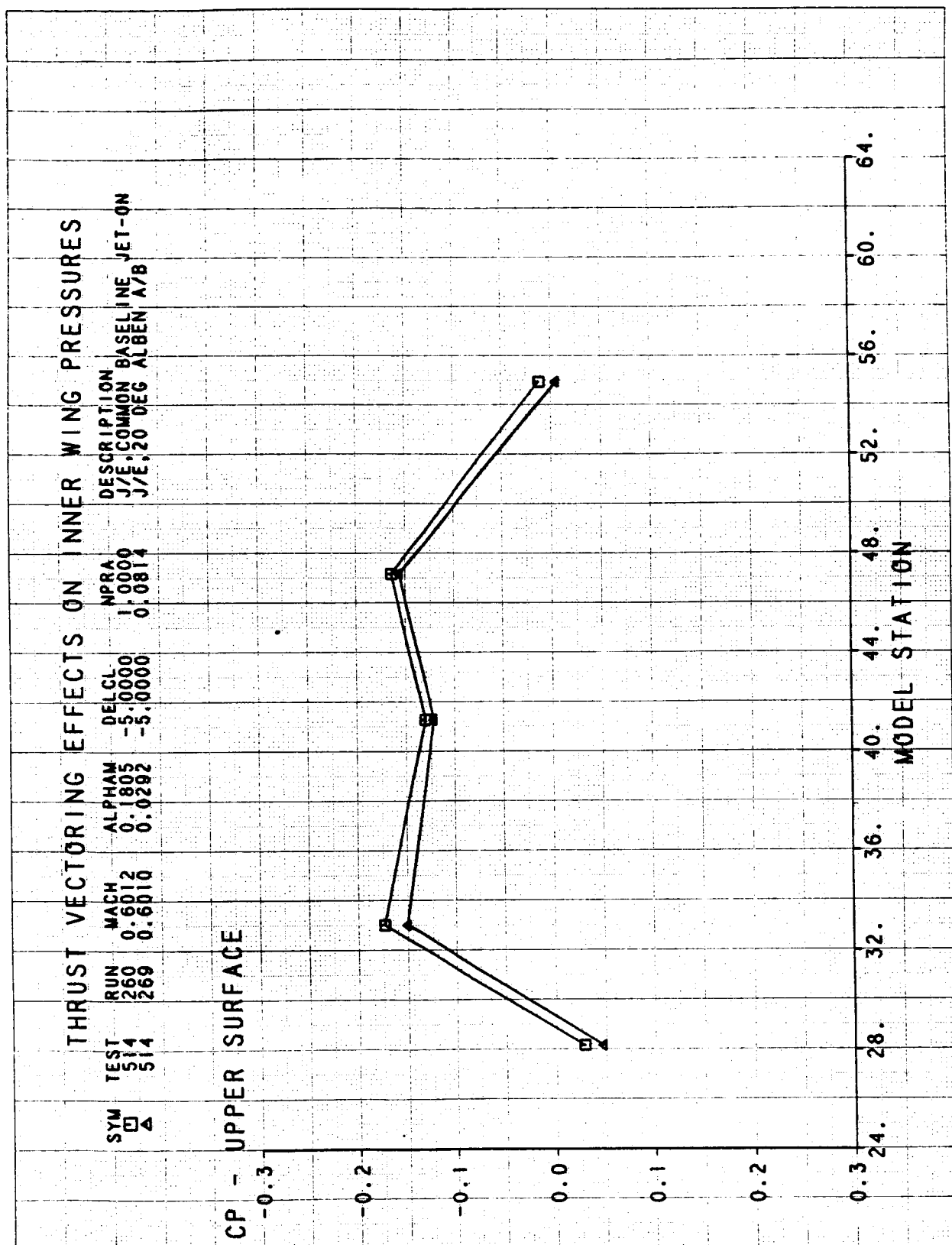
# THRUST VECTORING EFFECTS ON WING PRESSURES

SYM	TEST	RUN	MACH	ALPHAM	DELCL	NPRA	DESCRIPTION
□	514	260	0.6012	0.1805	-5.0000	1.0000	J/E; COMMON BASELINE
△	514	269	0.6010	0.0292	-5.0000	0.0814	J/E; 20 DEG ALBEN A/B

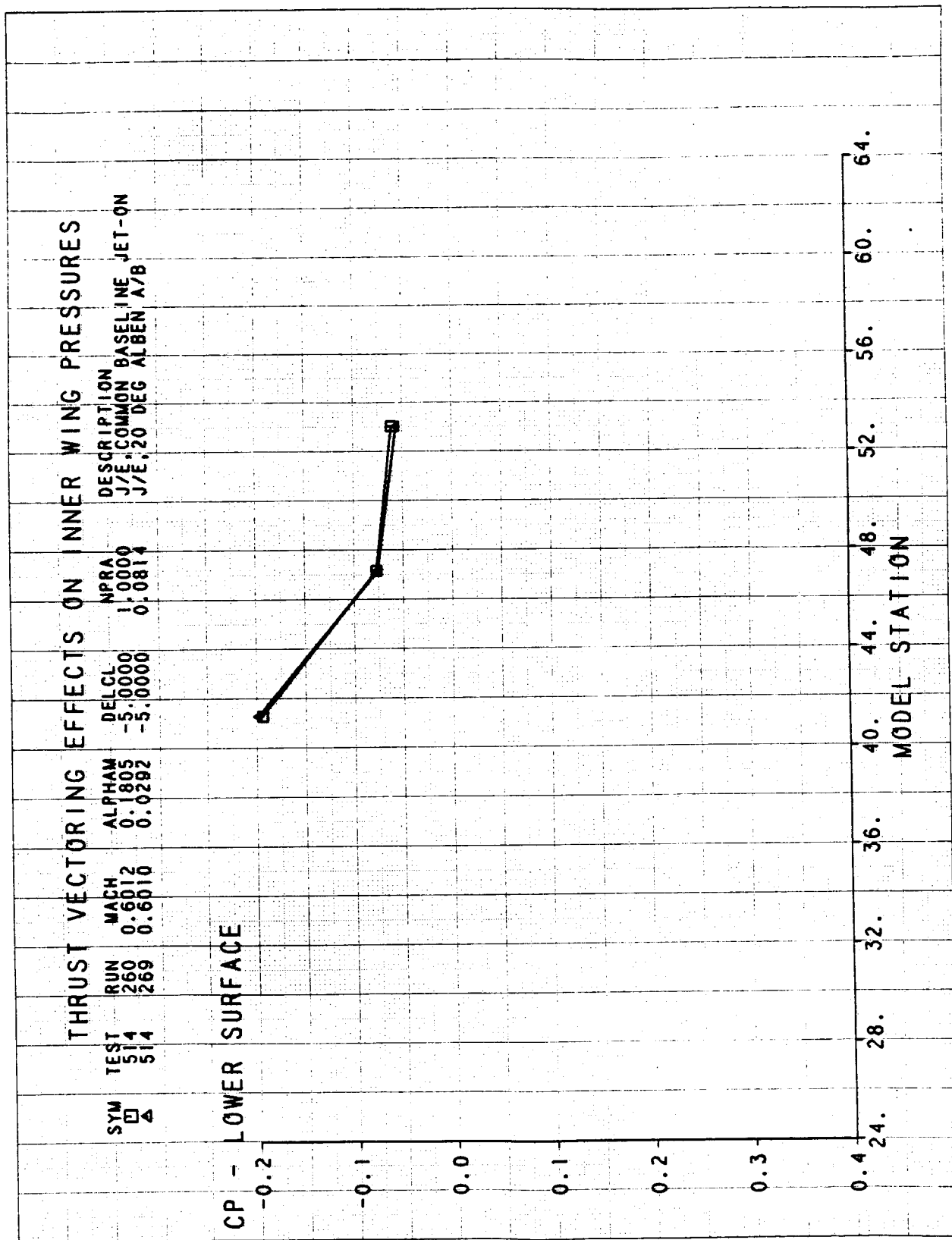
CP - UPPER SURFACE

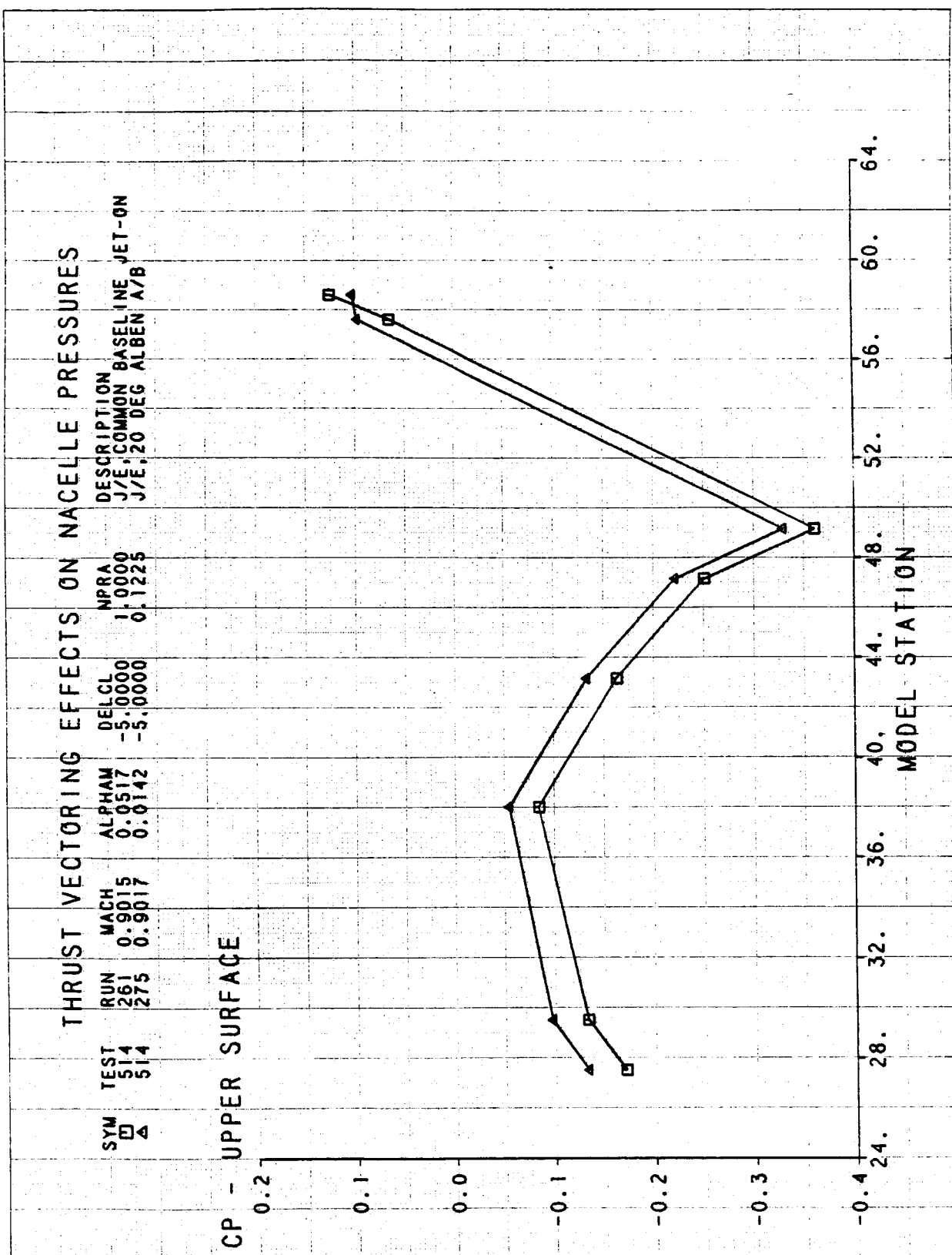


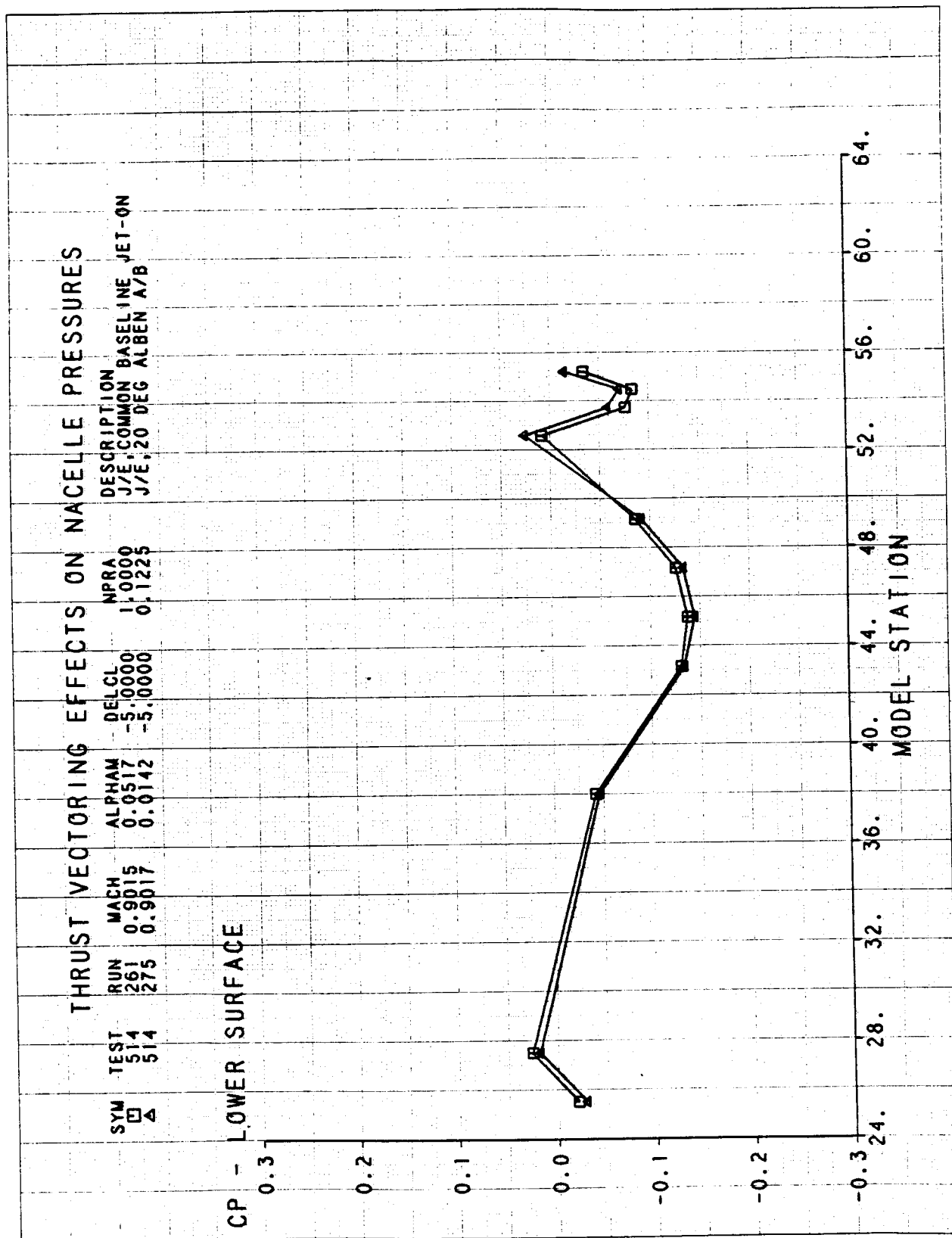


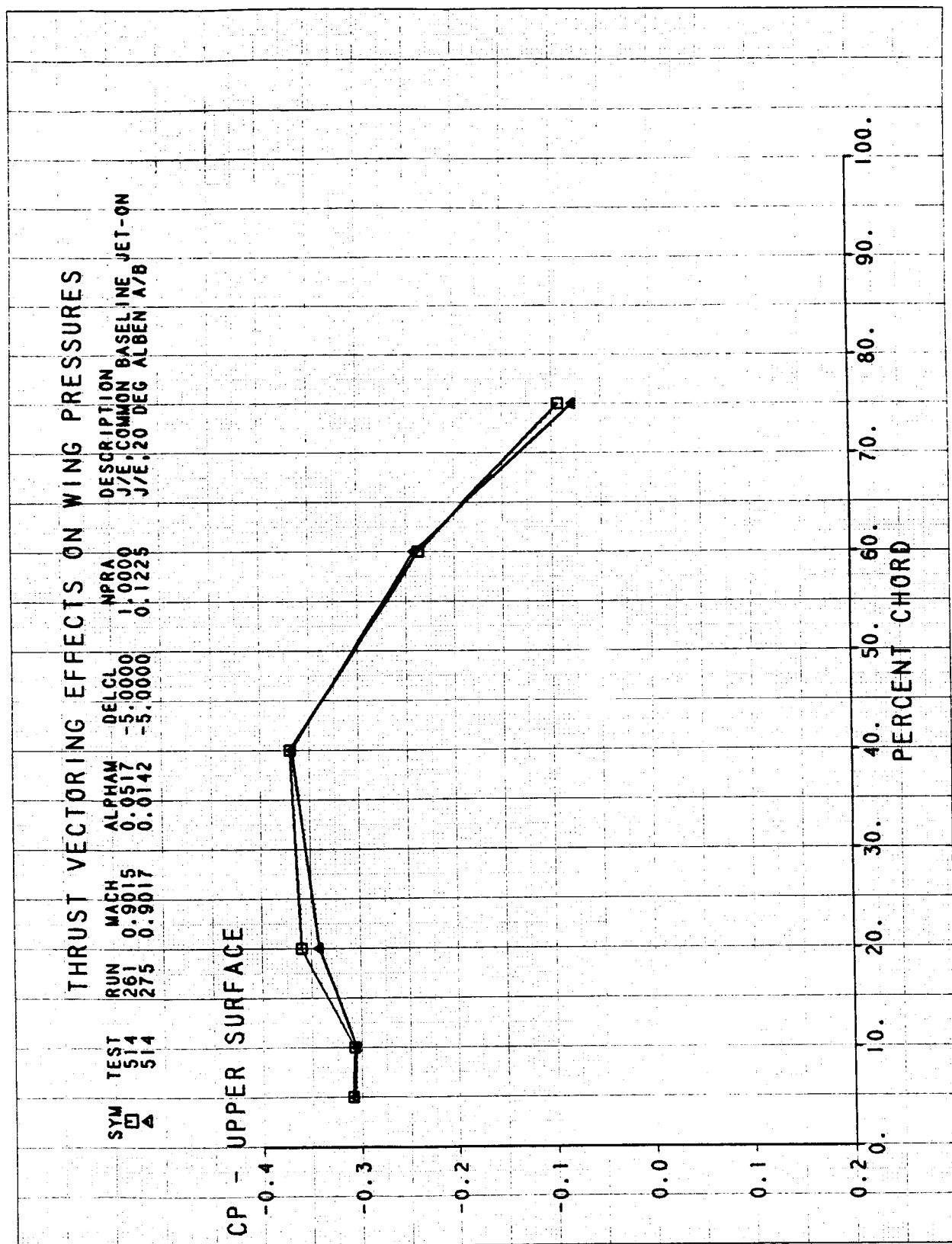


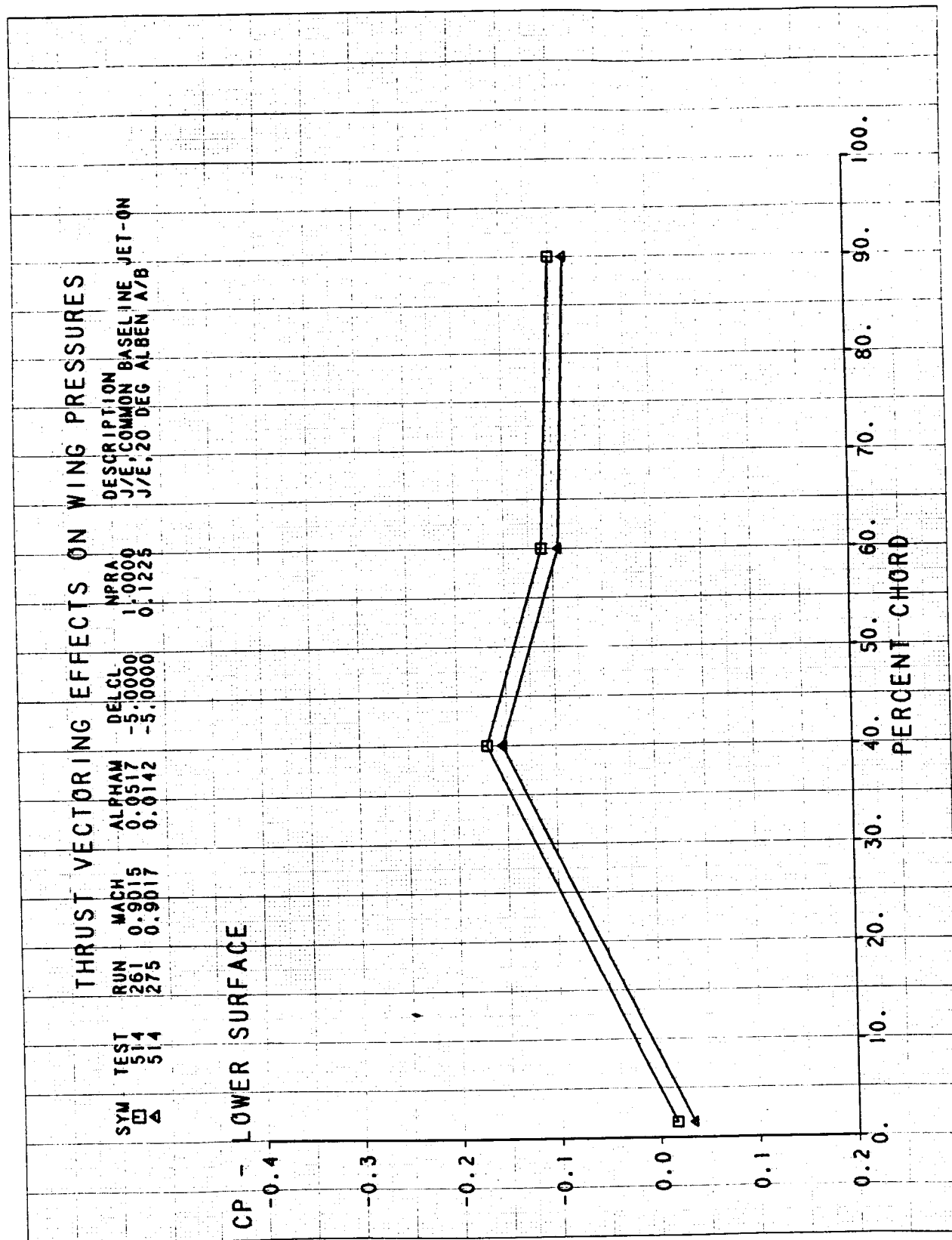


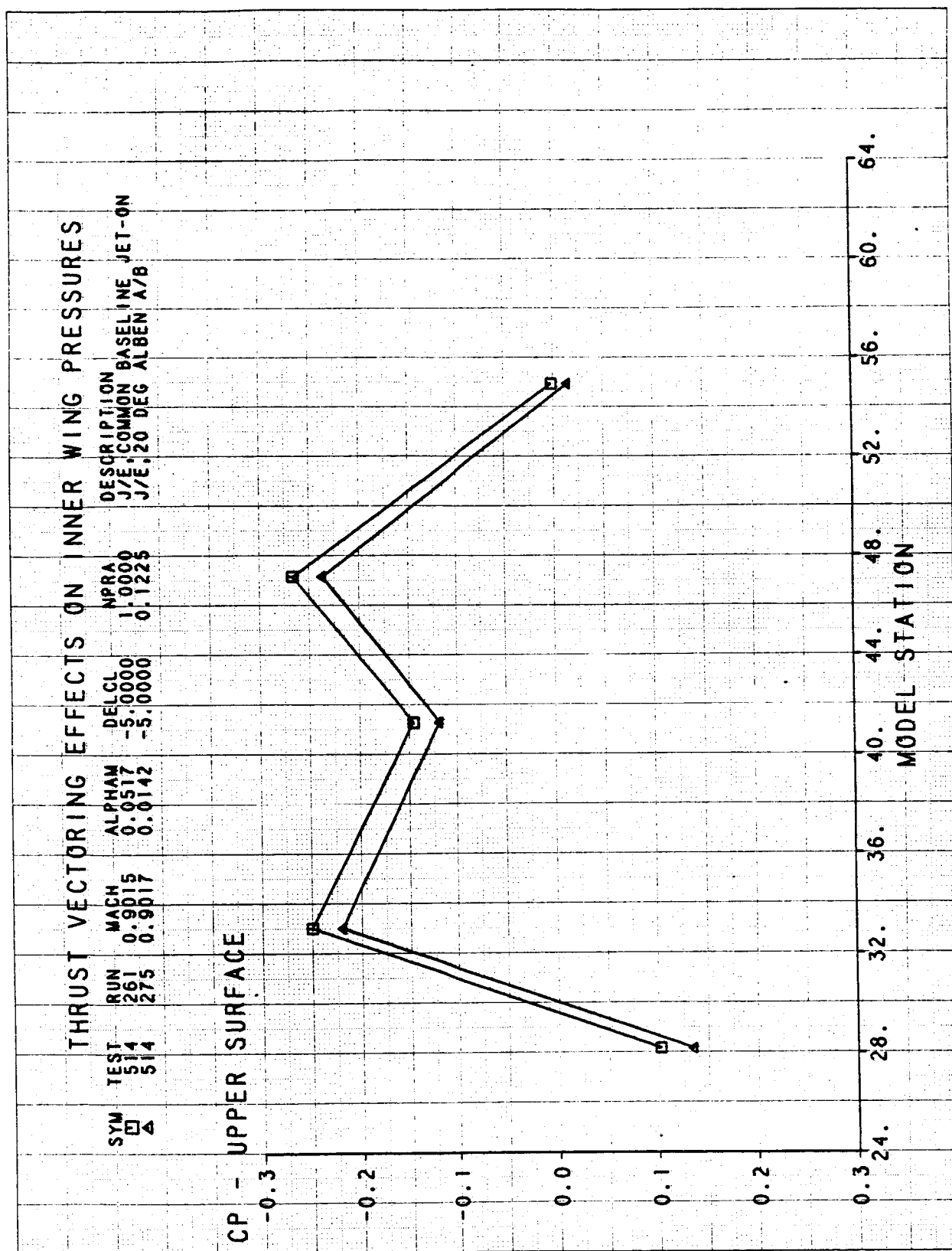


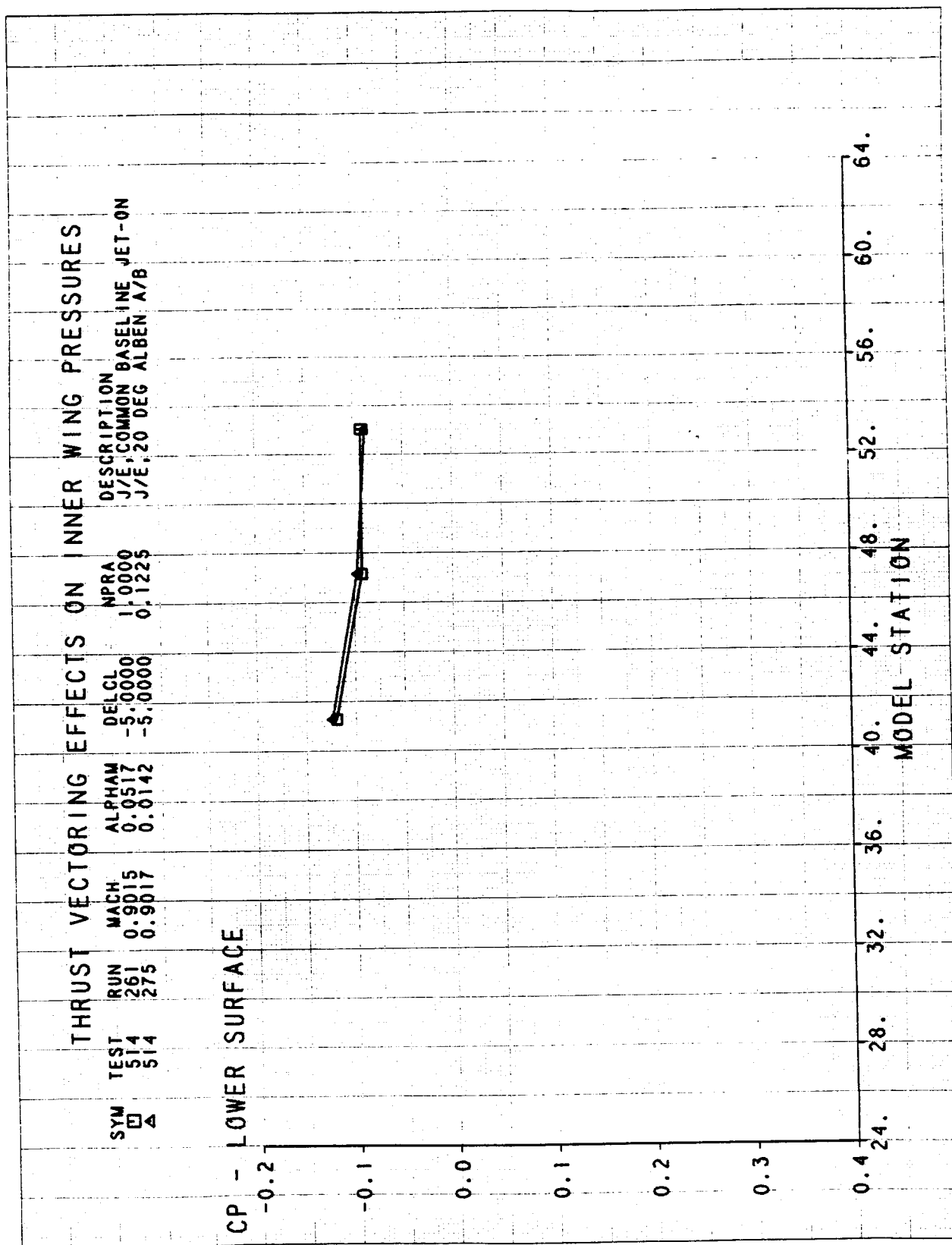


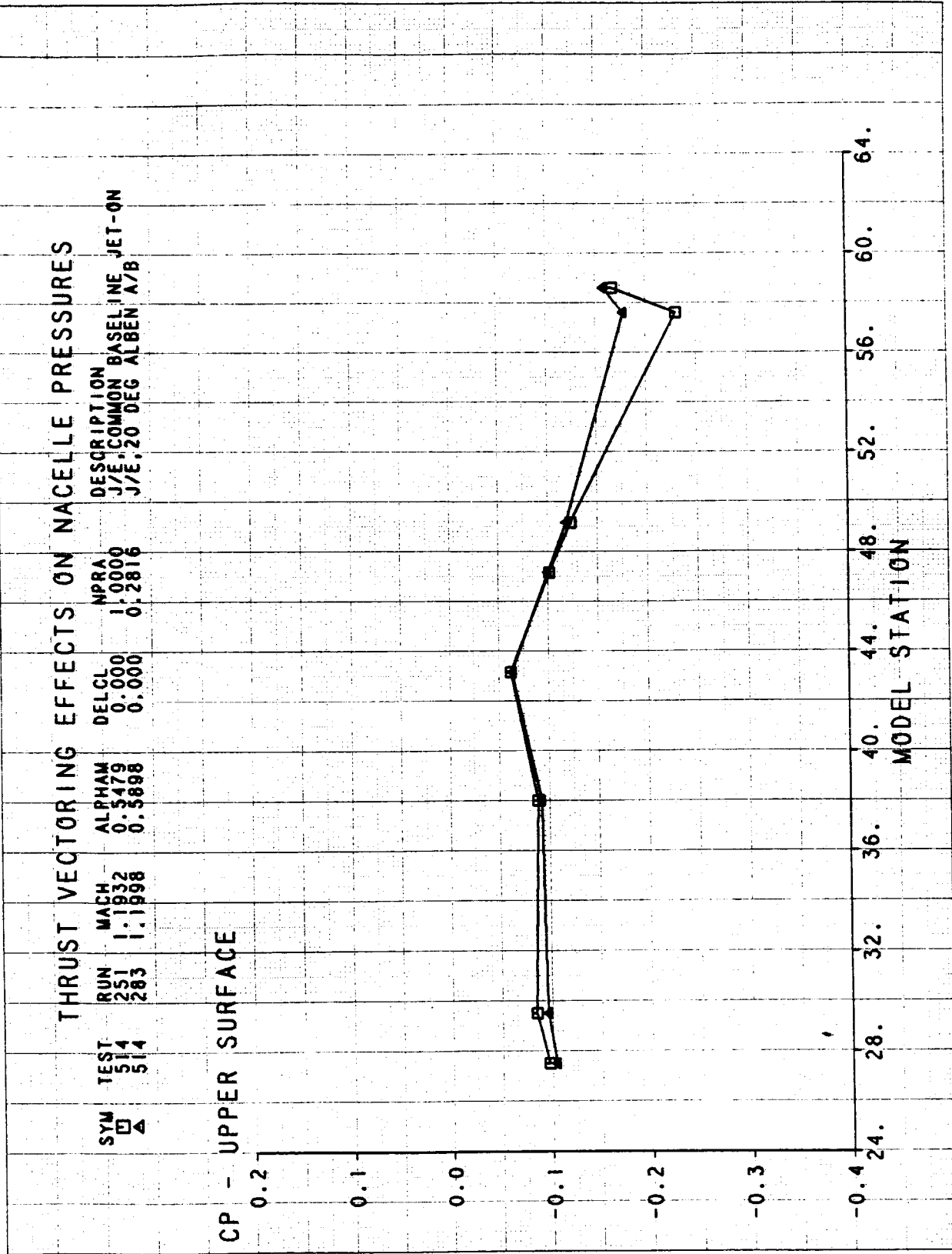




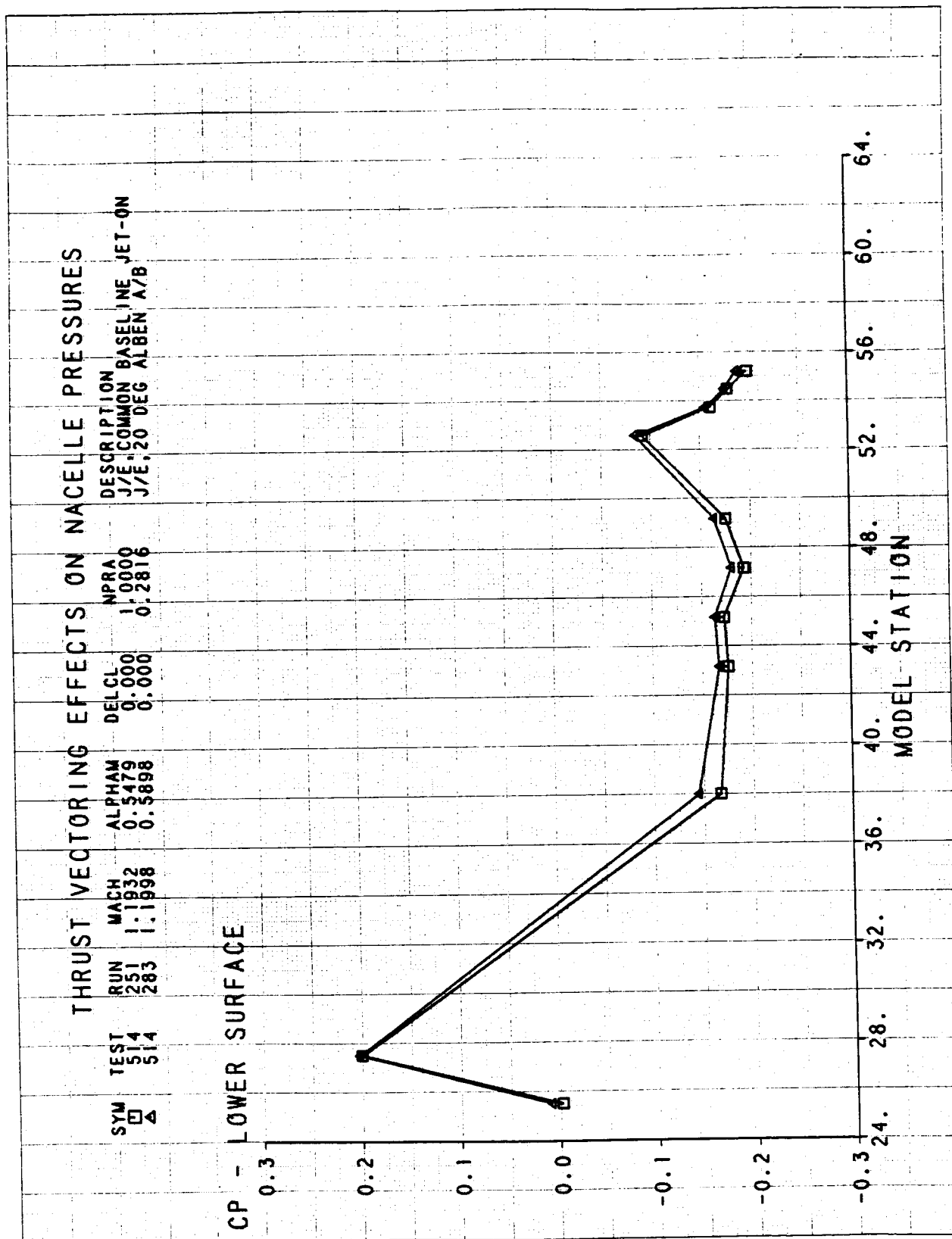


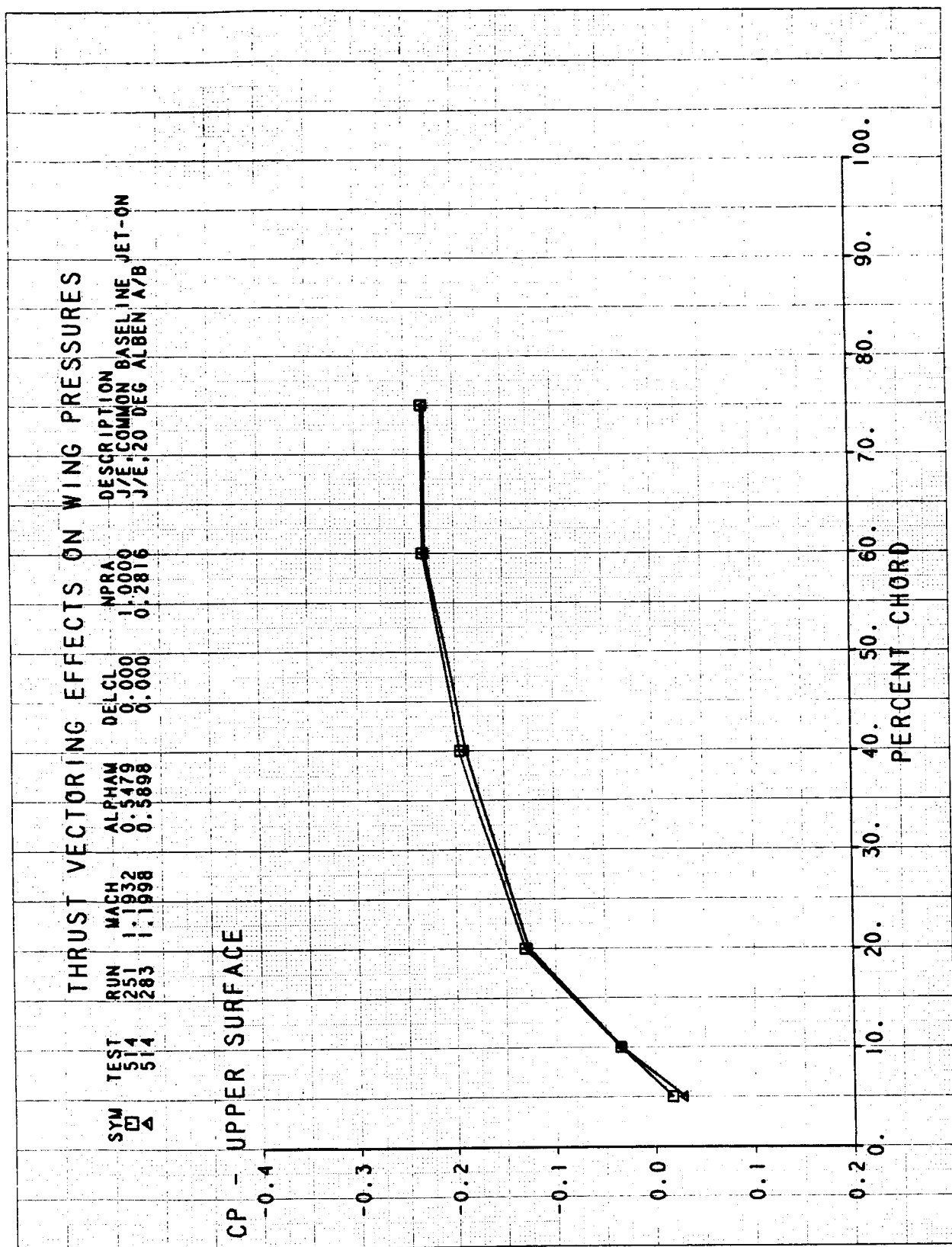


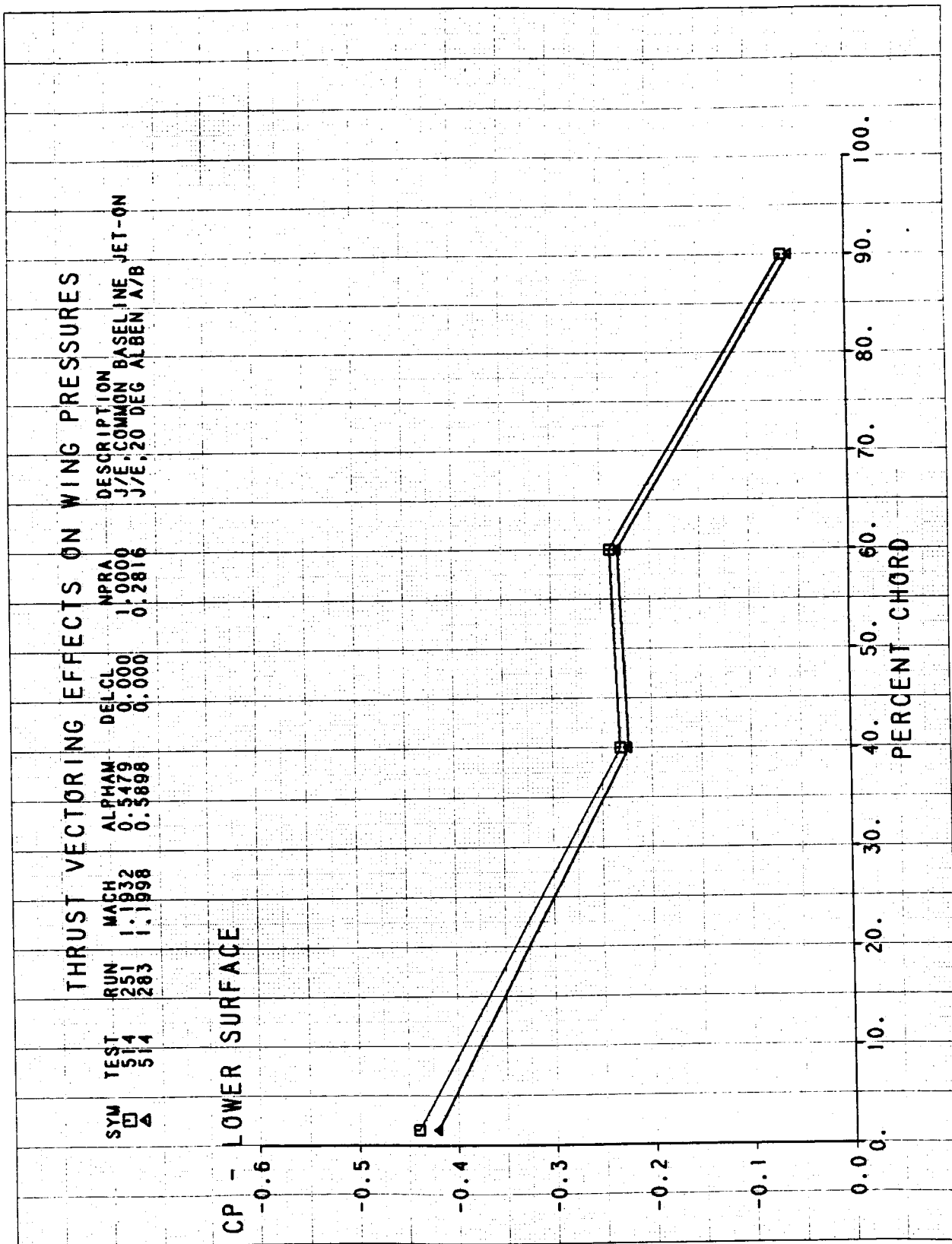








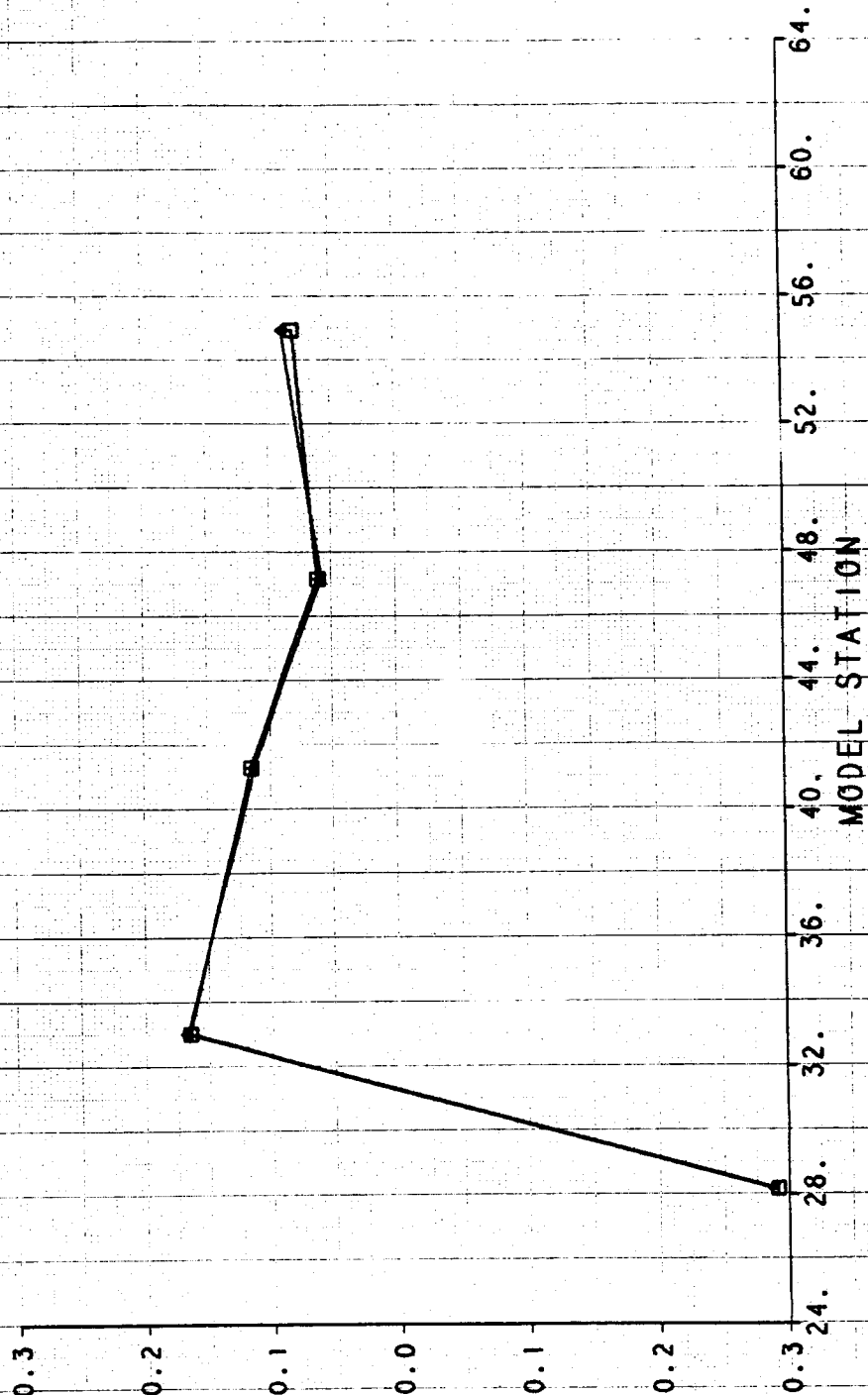


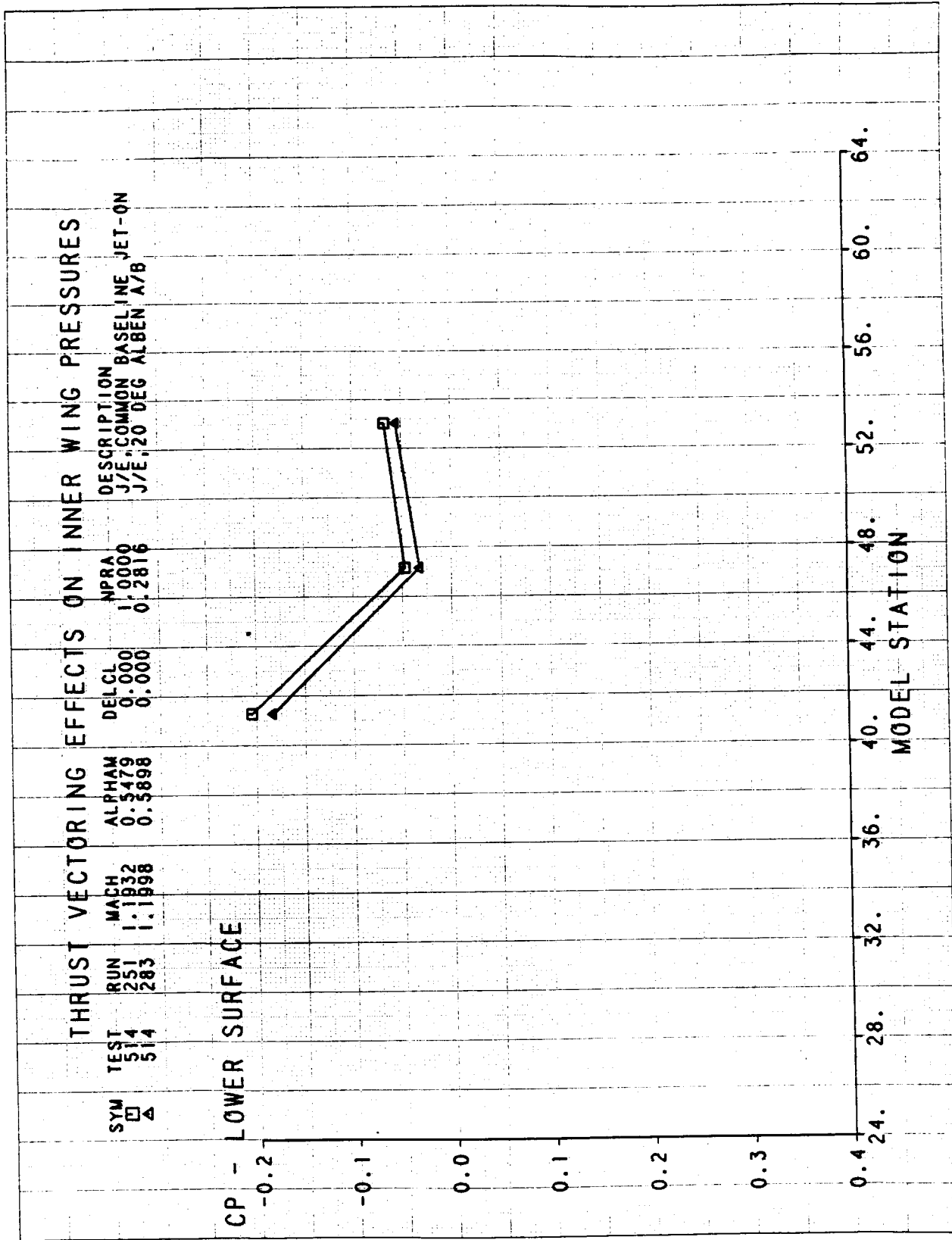


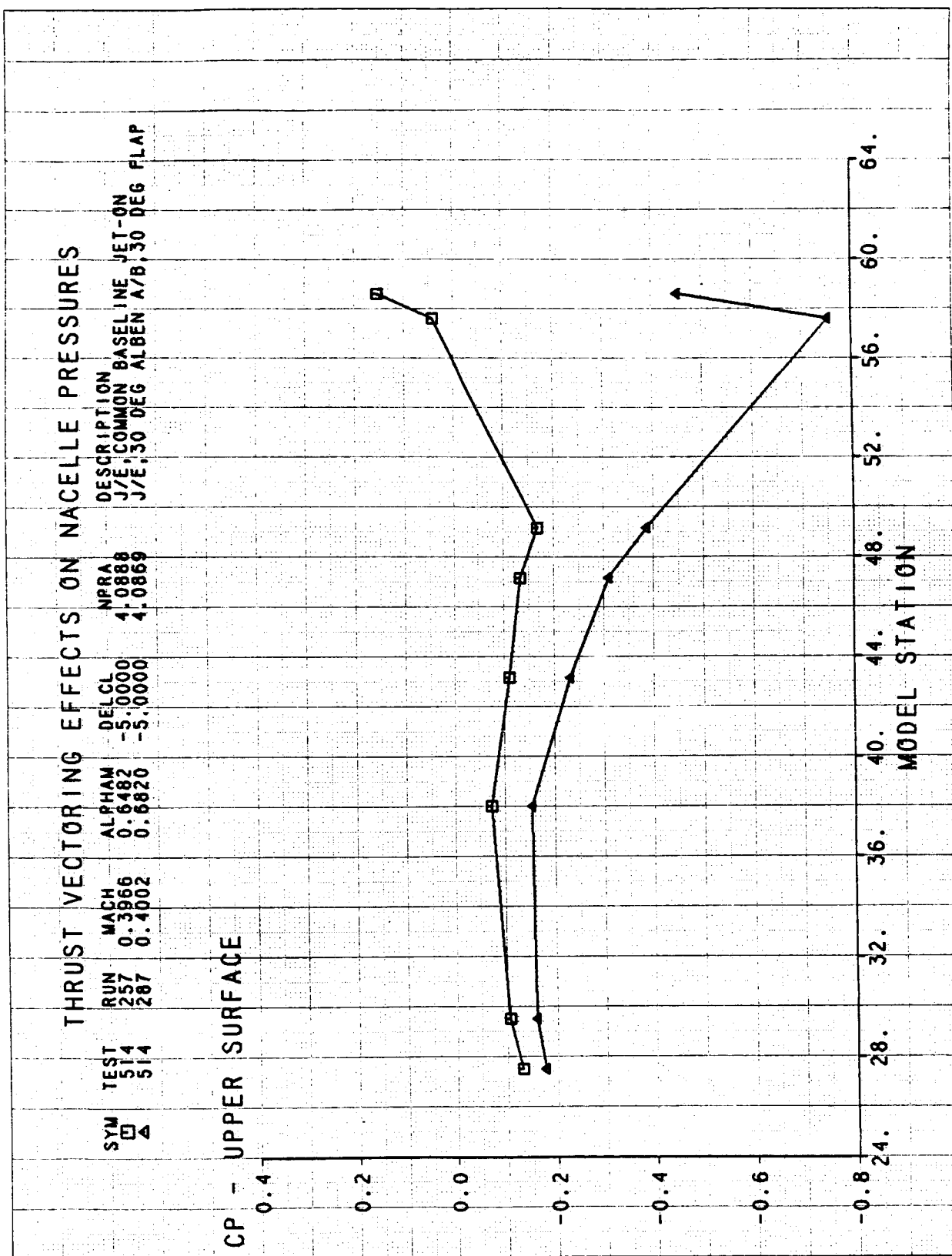
# THRUST VECTORING EFFECTS ON INNER WING PRESSURES

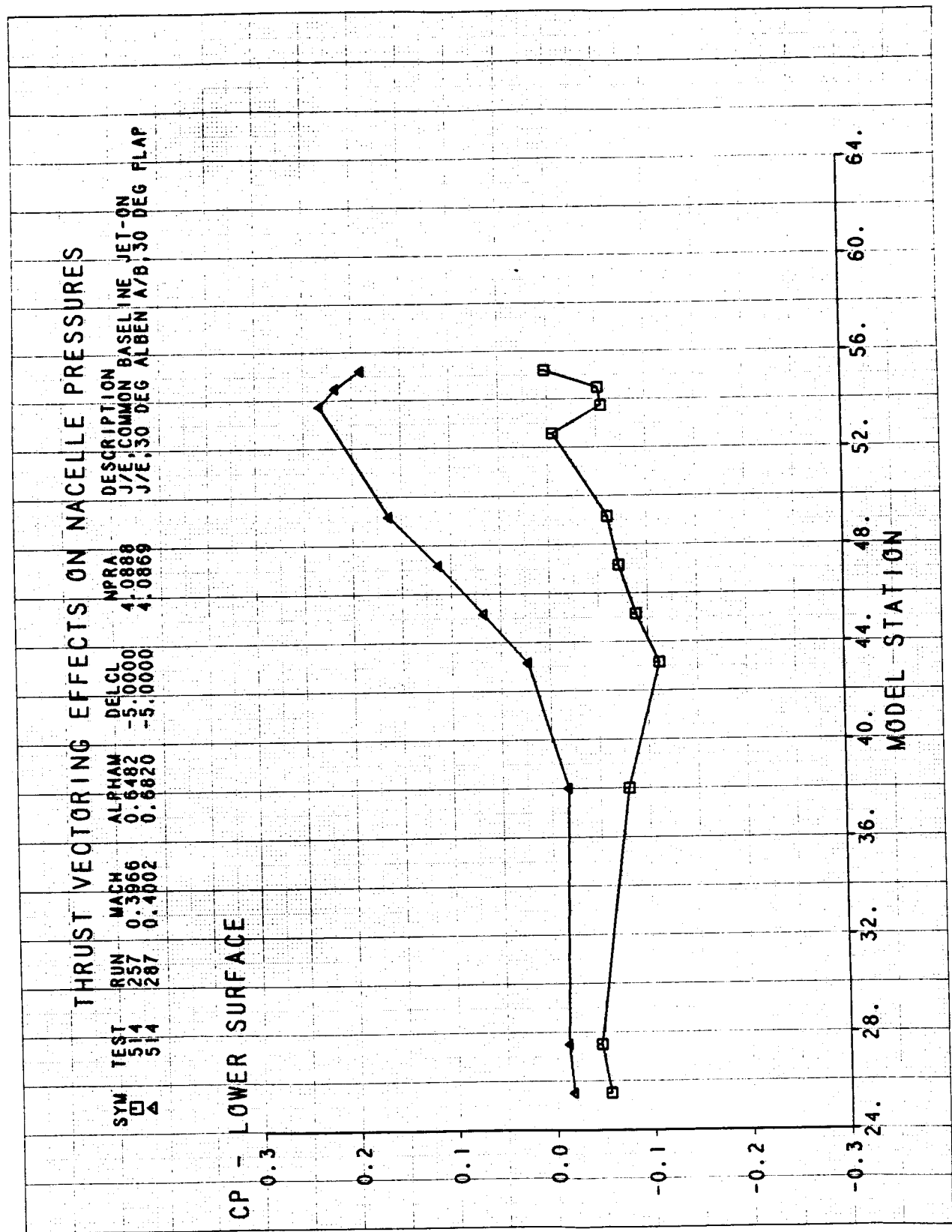
SYM	TEST	RUN	MACH	ALPHA	DELCL	MPRA	DESCRIPTION
□	514	251	1.1932	0.5479	0.000	1.0000	J/E, COMMON BASELINE
△	514	283	1.1998	0.5898	0.000	0.2816	J/E, 20 DEG ALBEN A/B

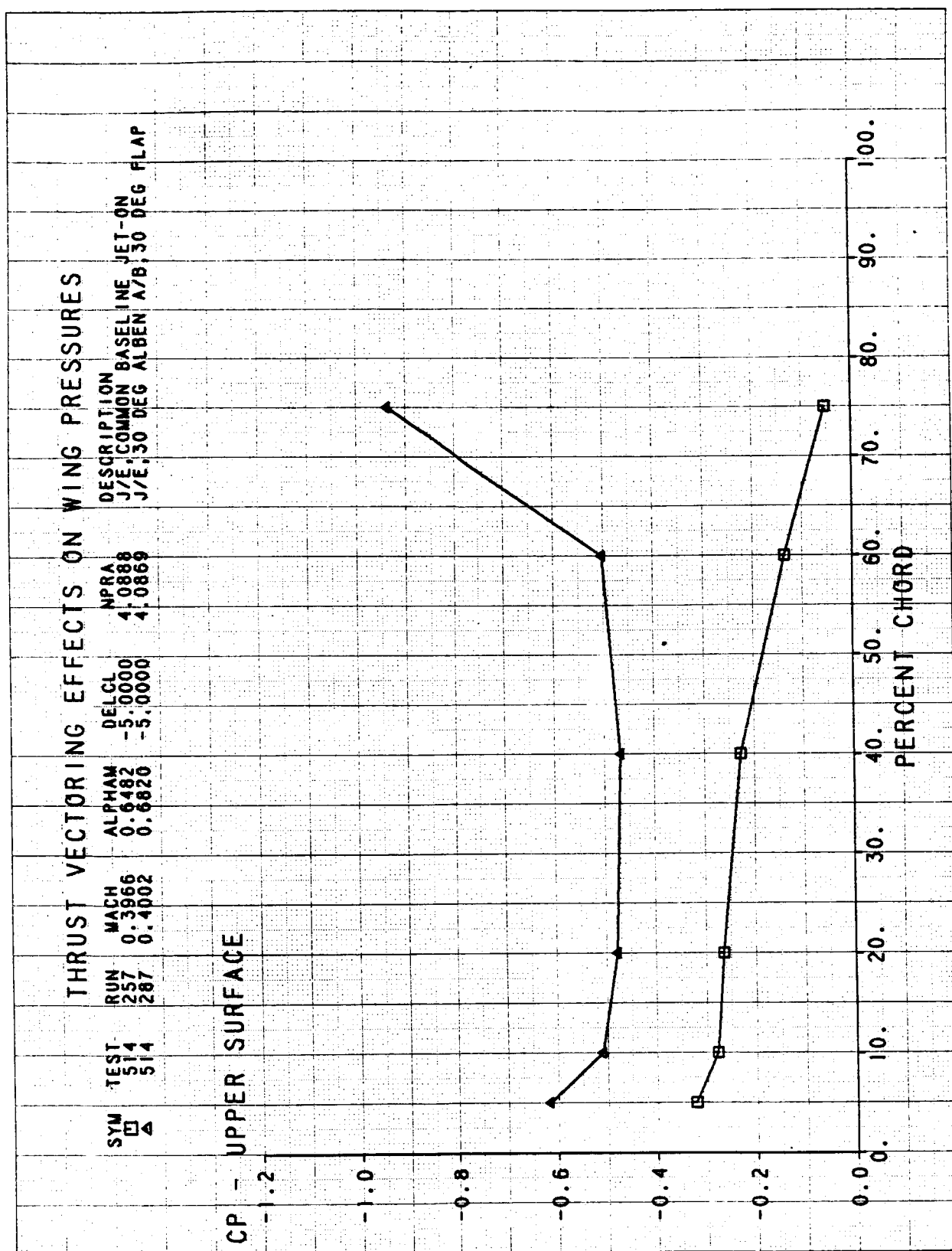
CP - UPPER SURFACE



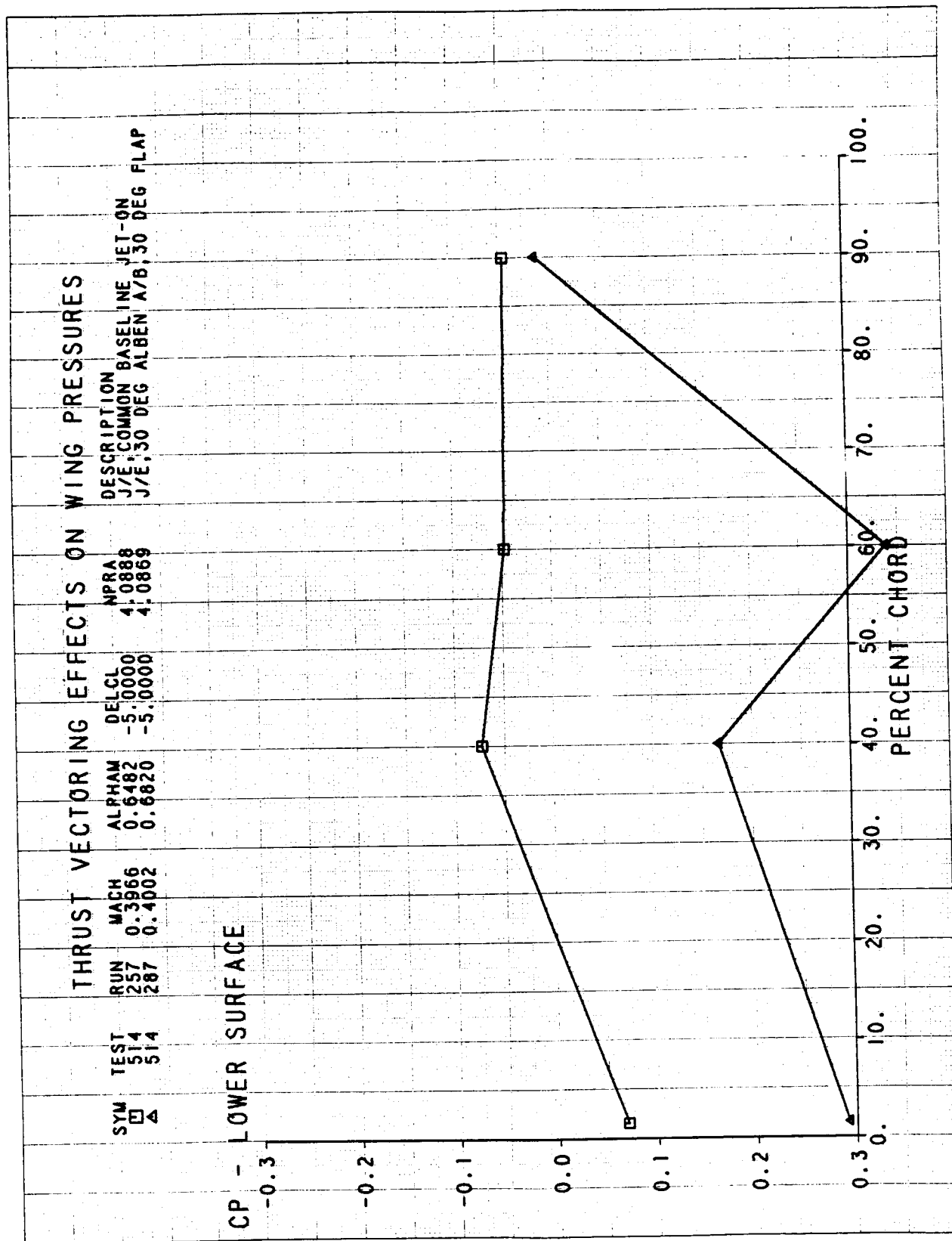


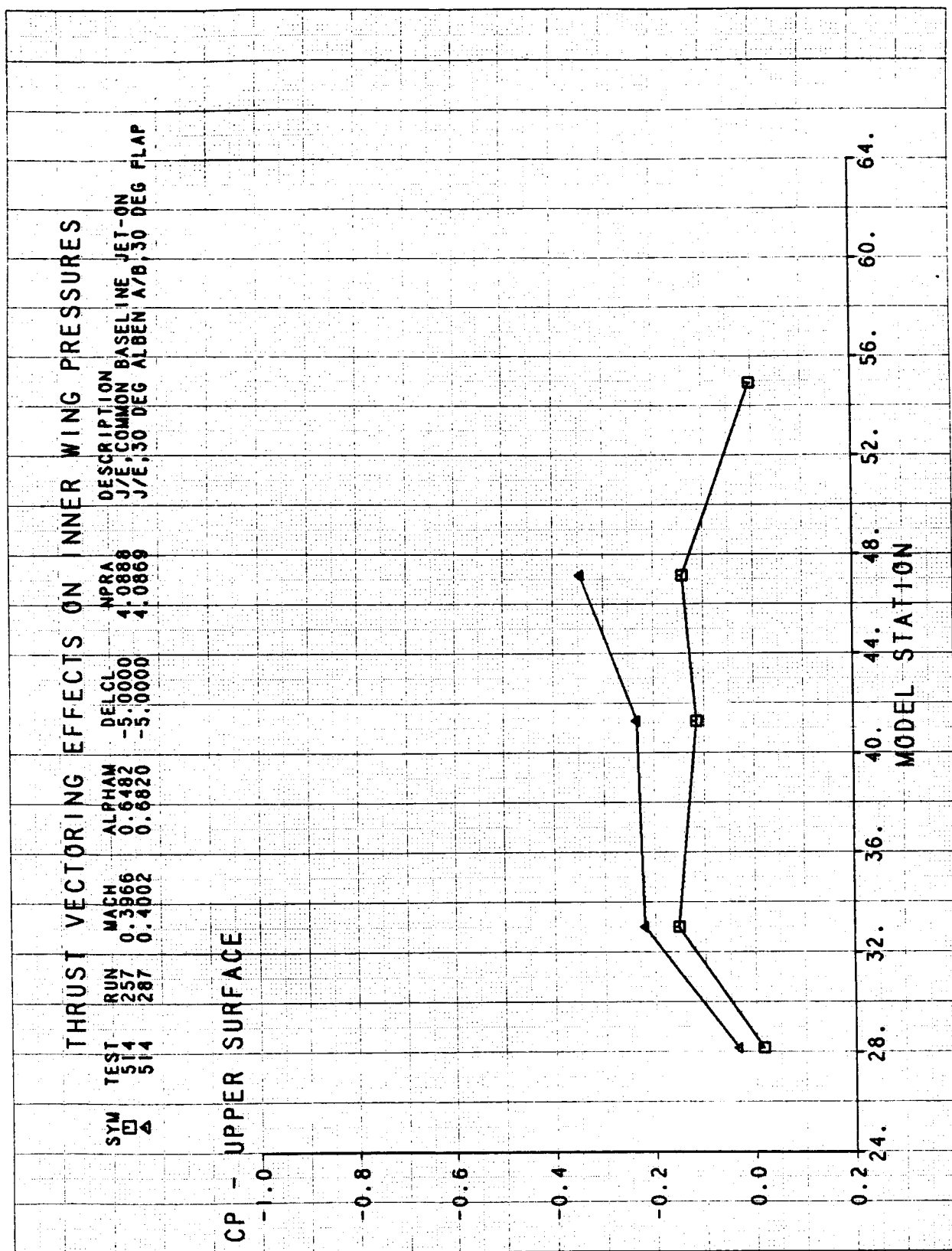


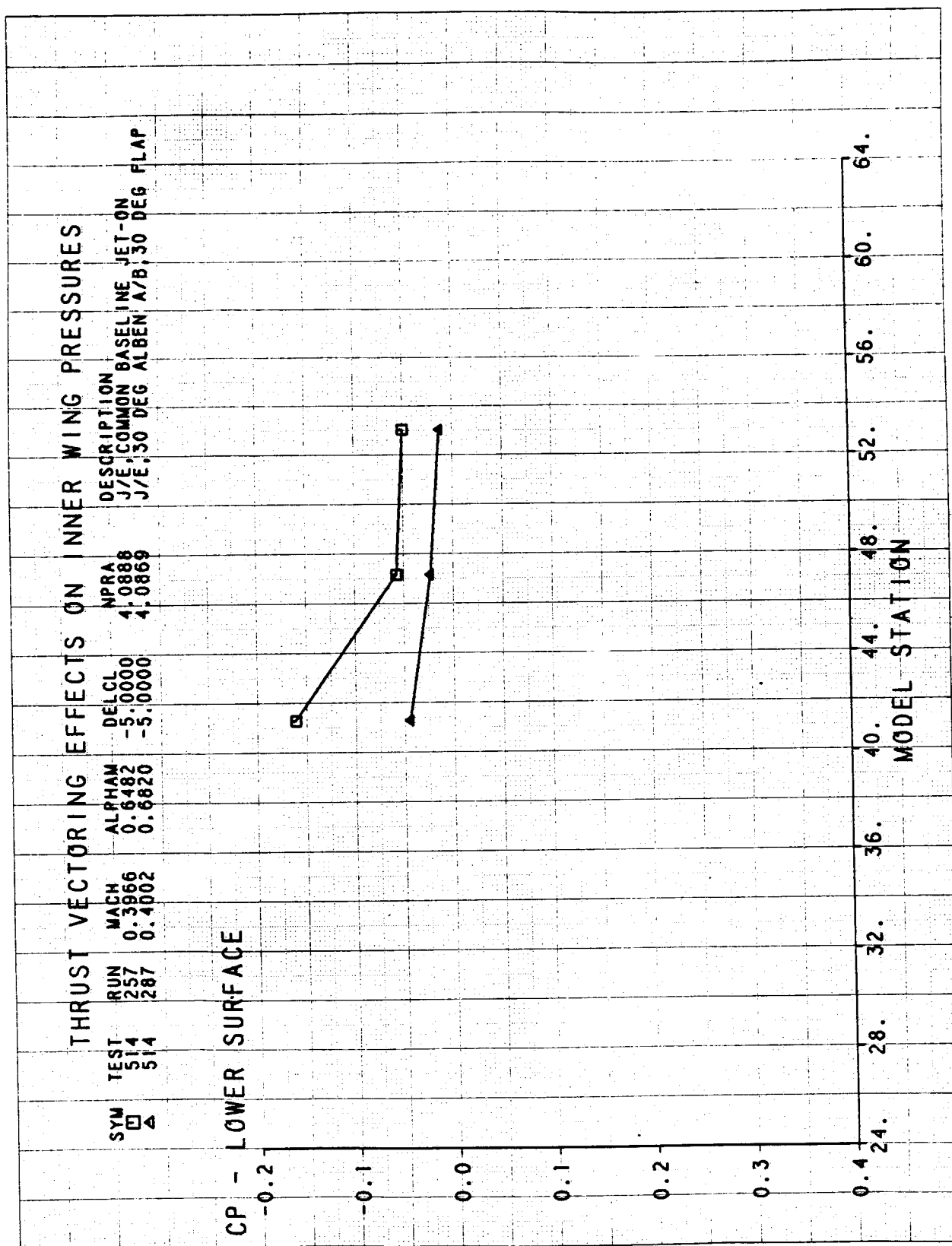


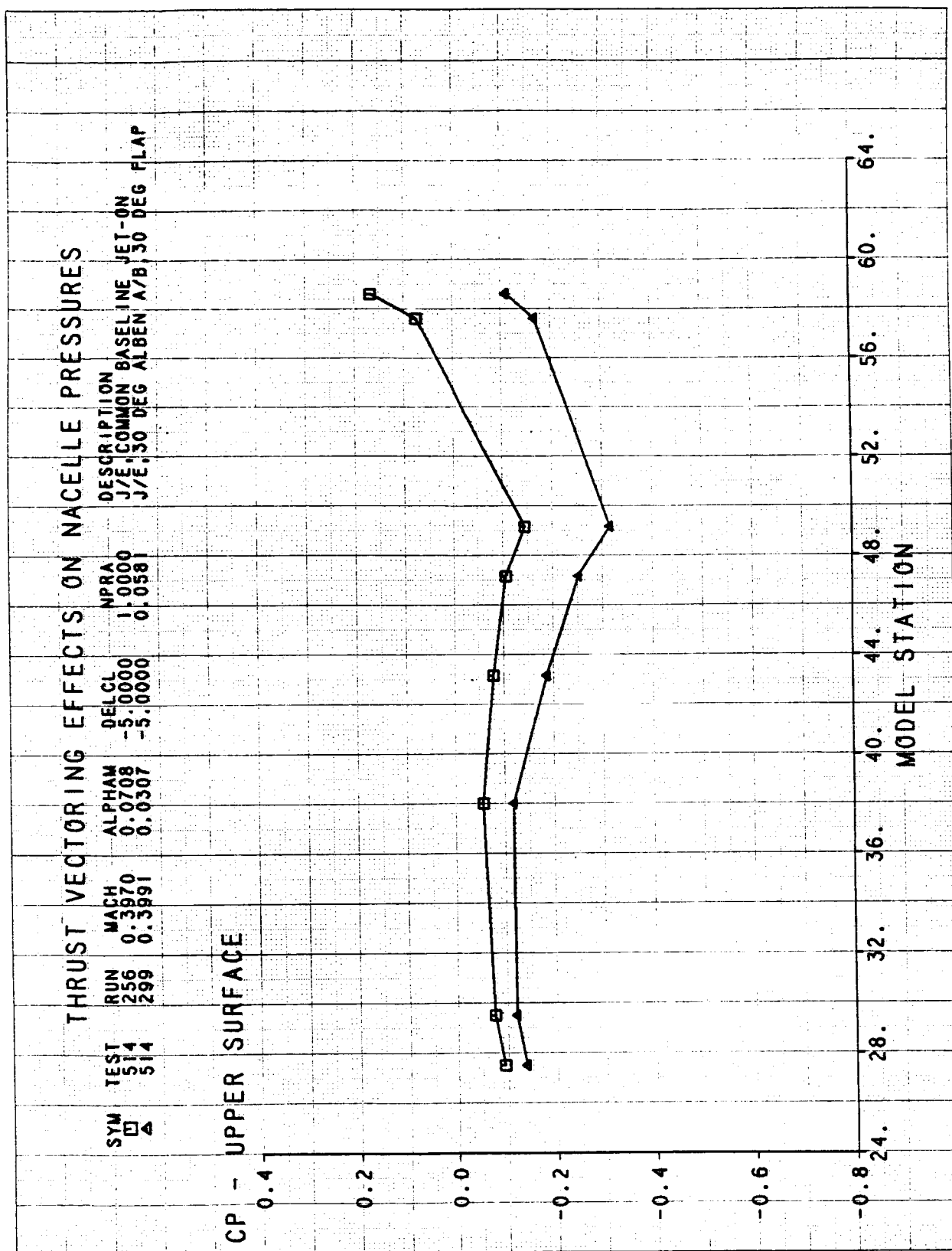


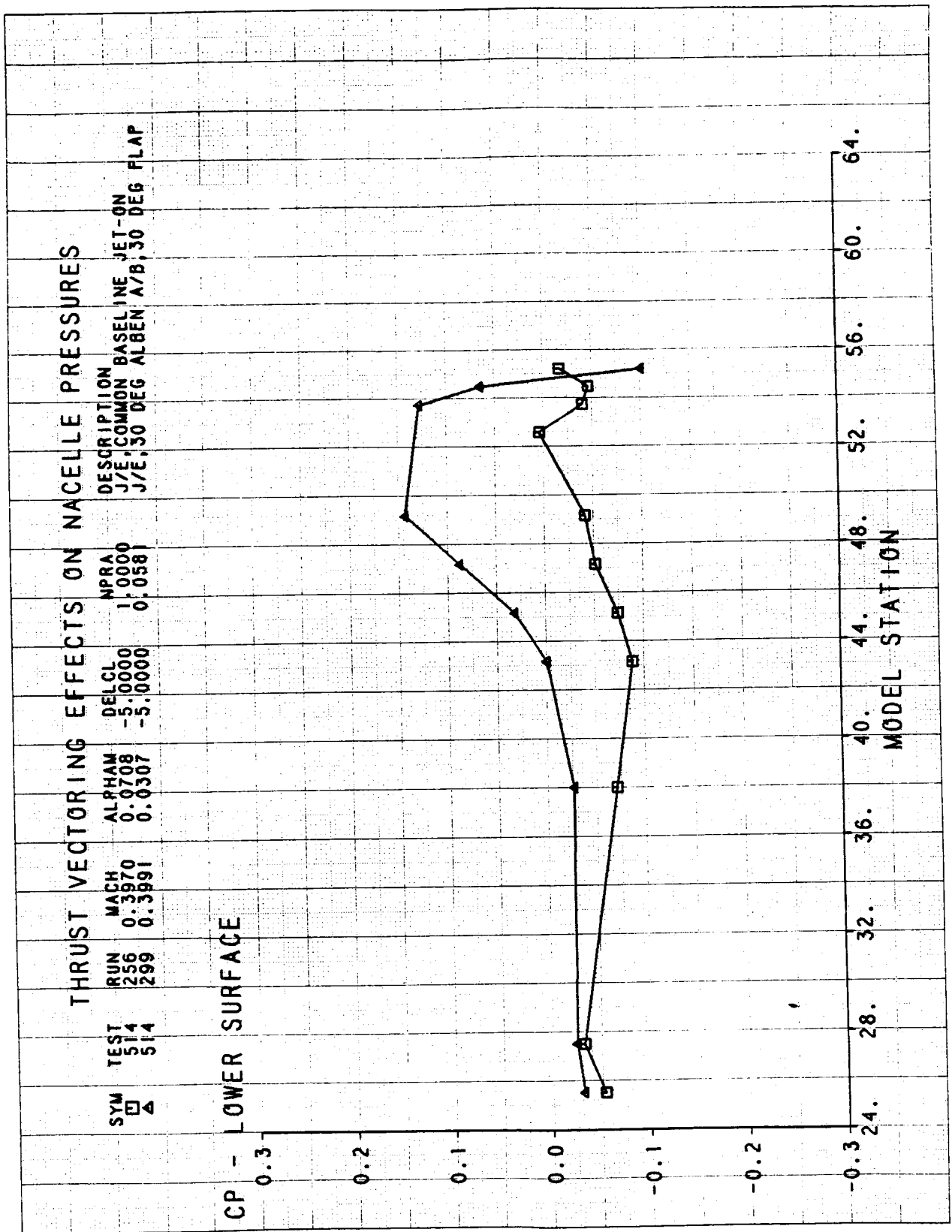


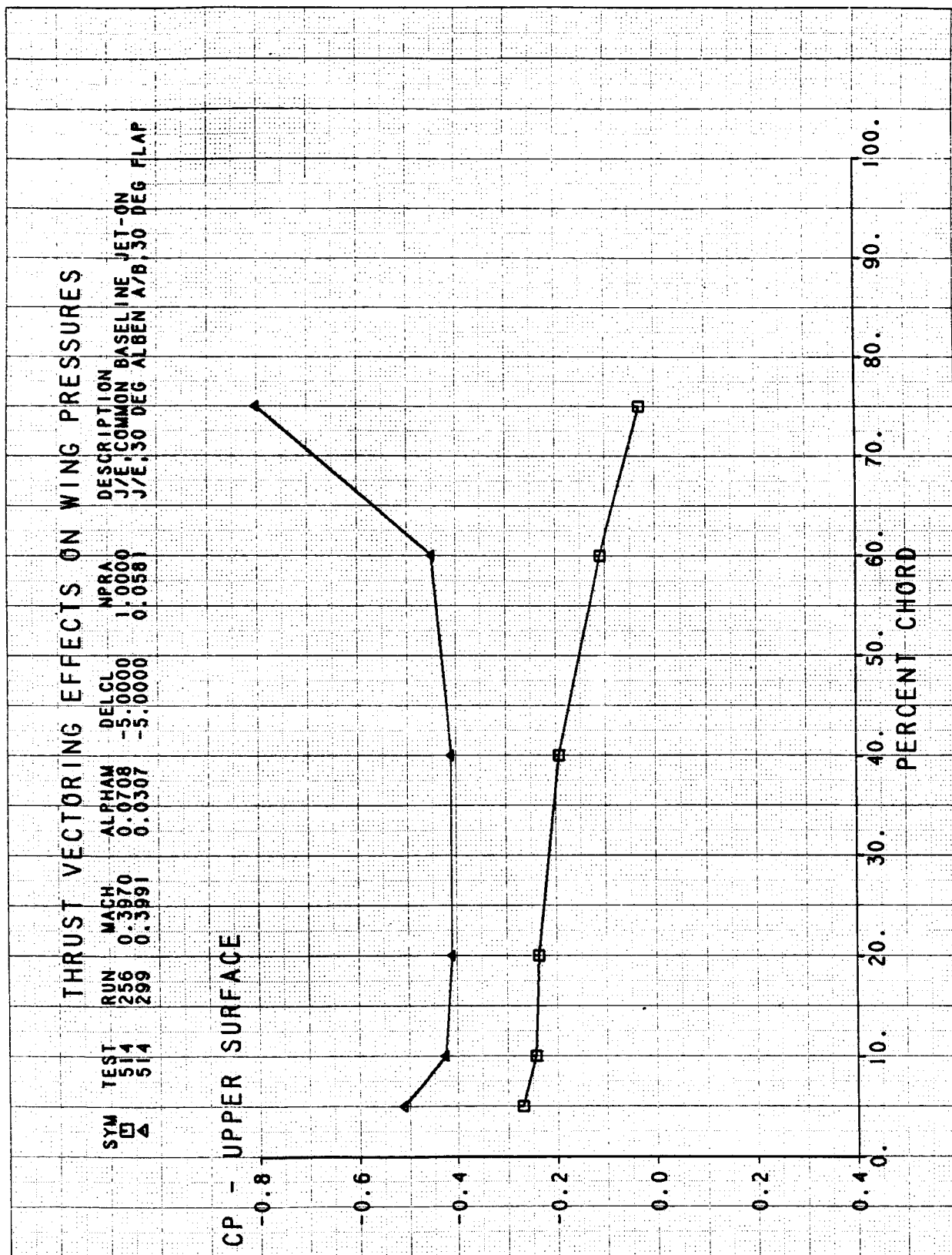


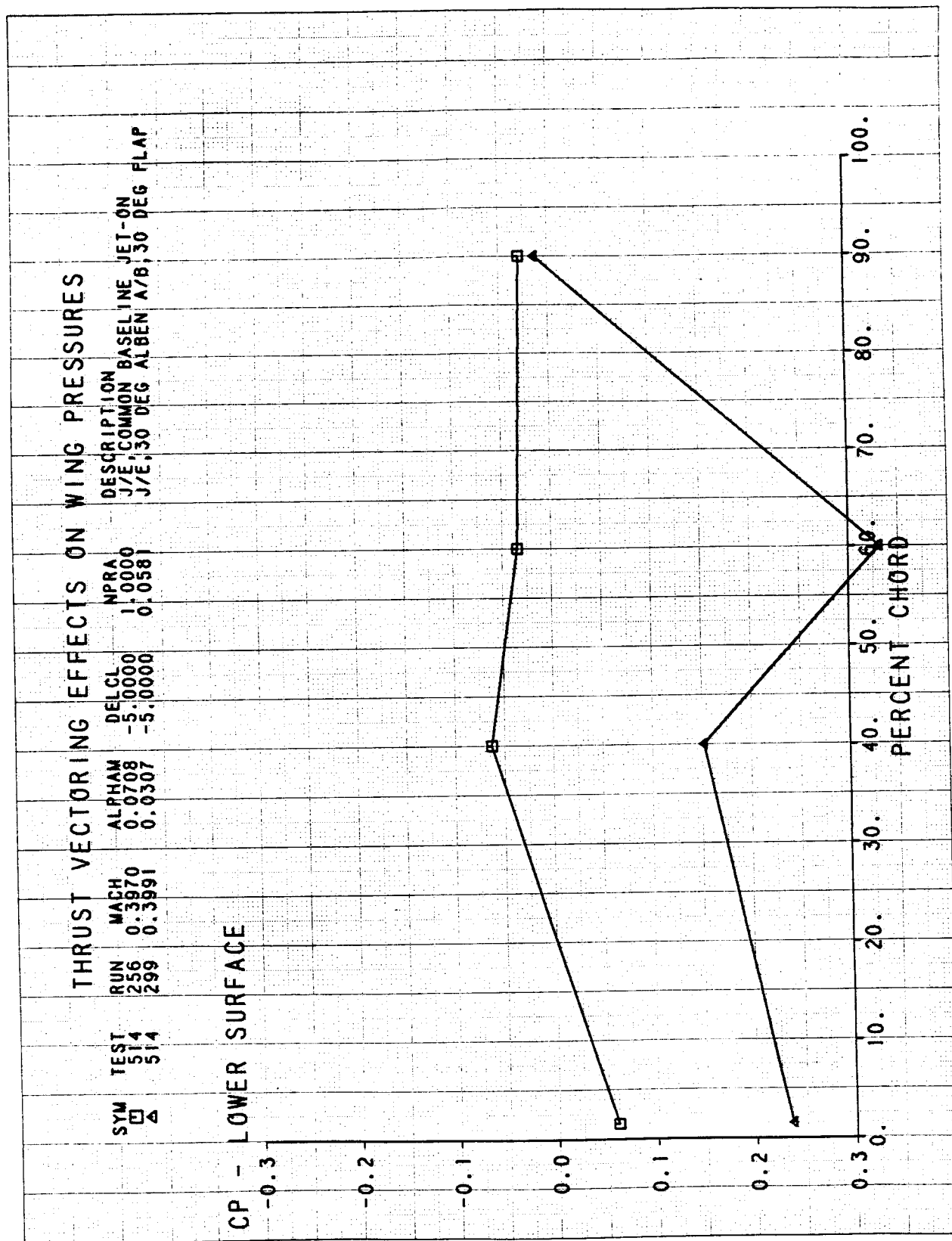


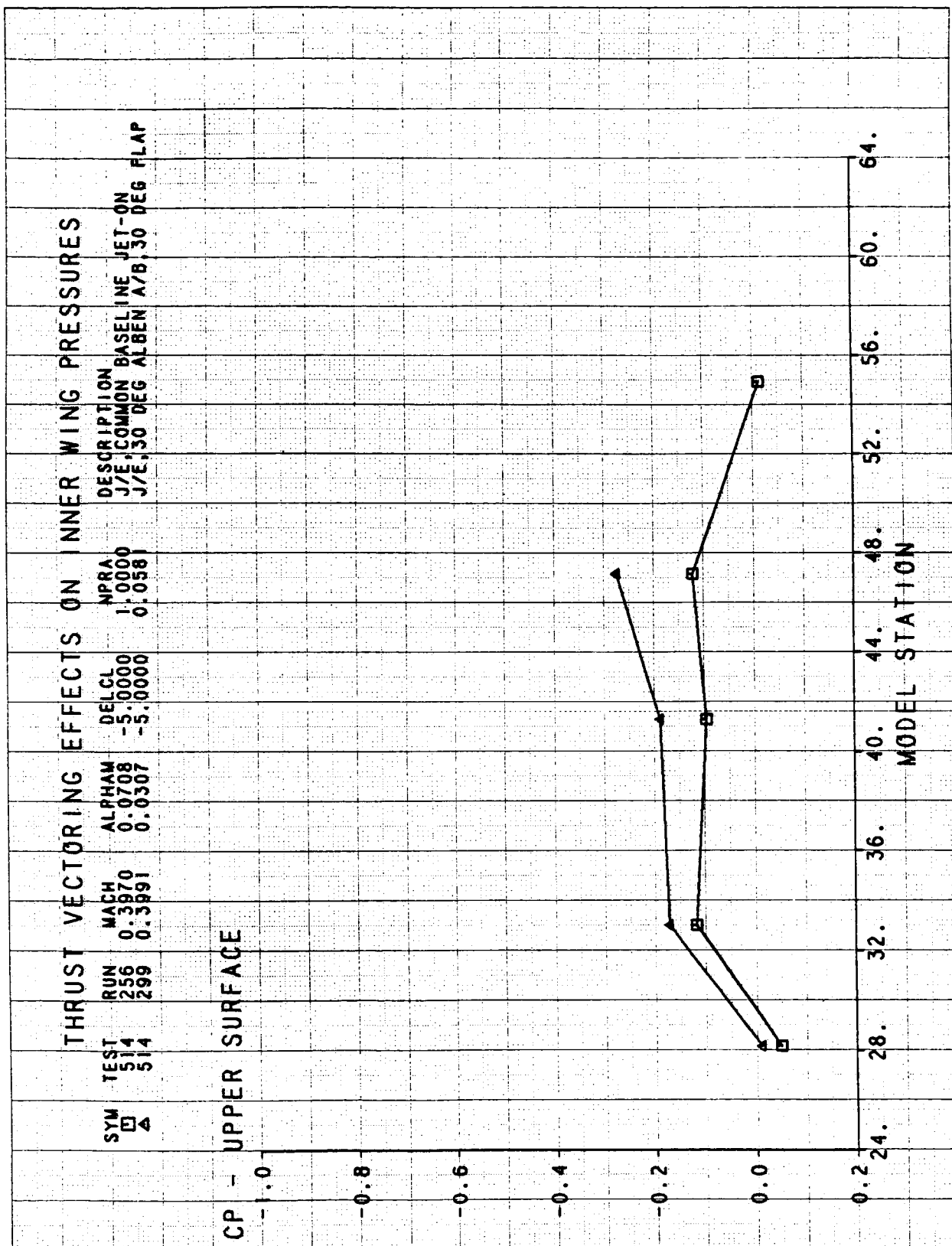




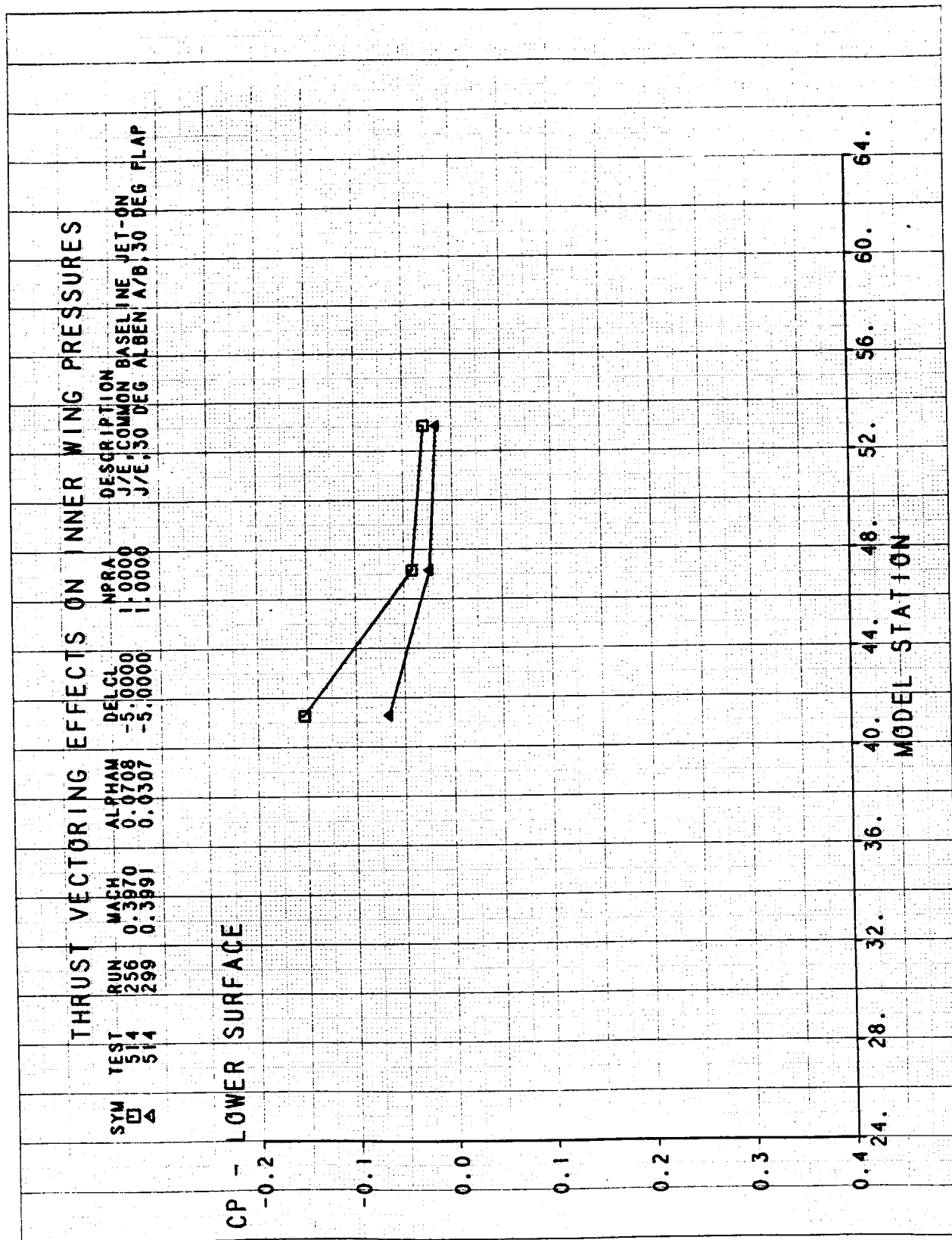


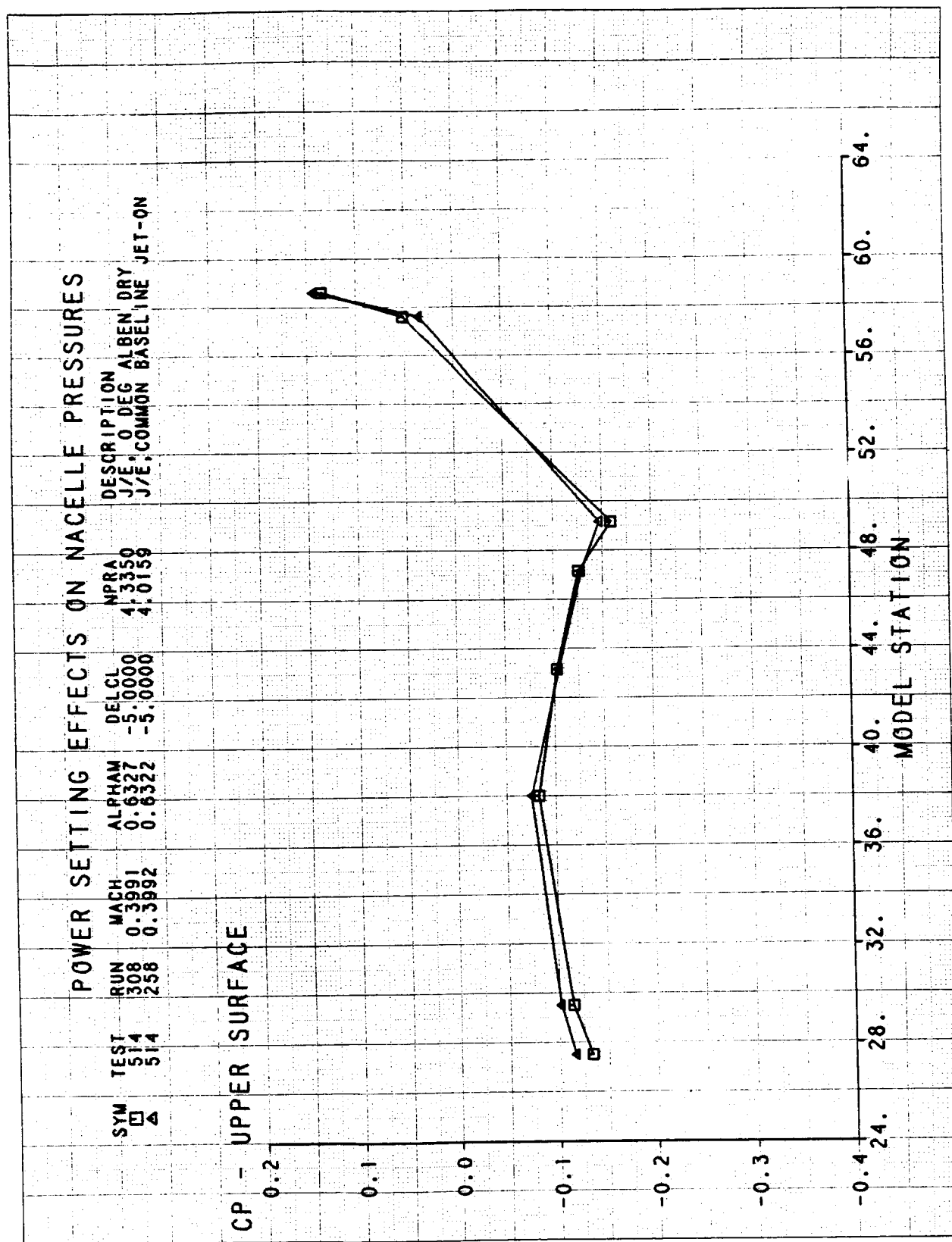


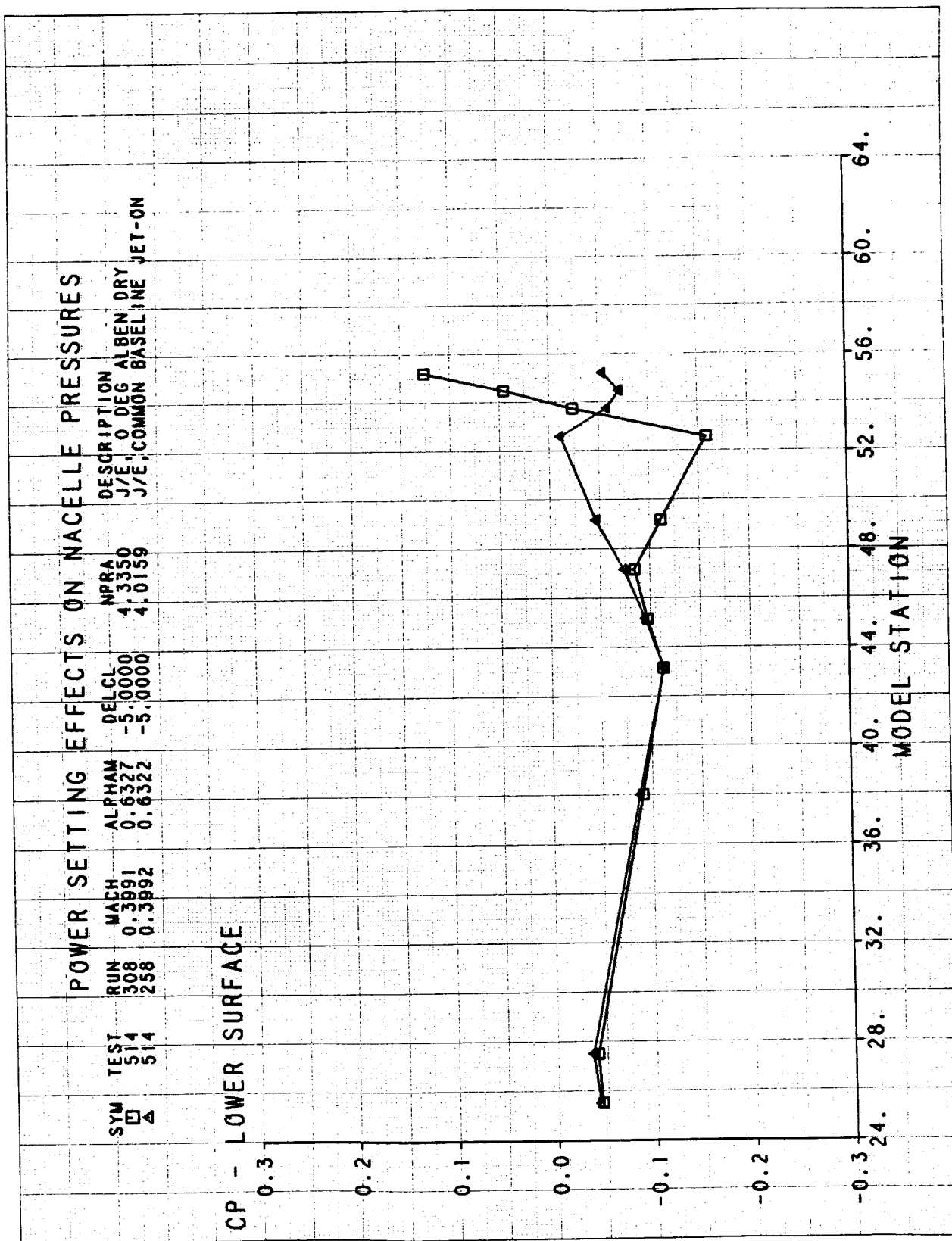


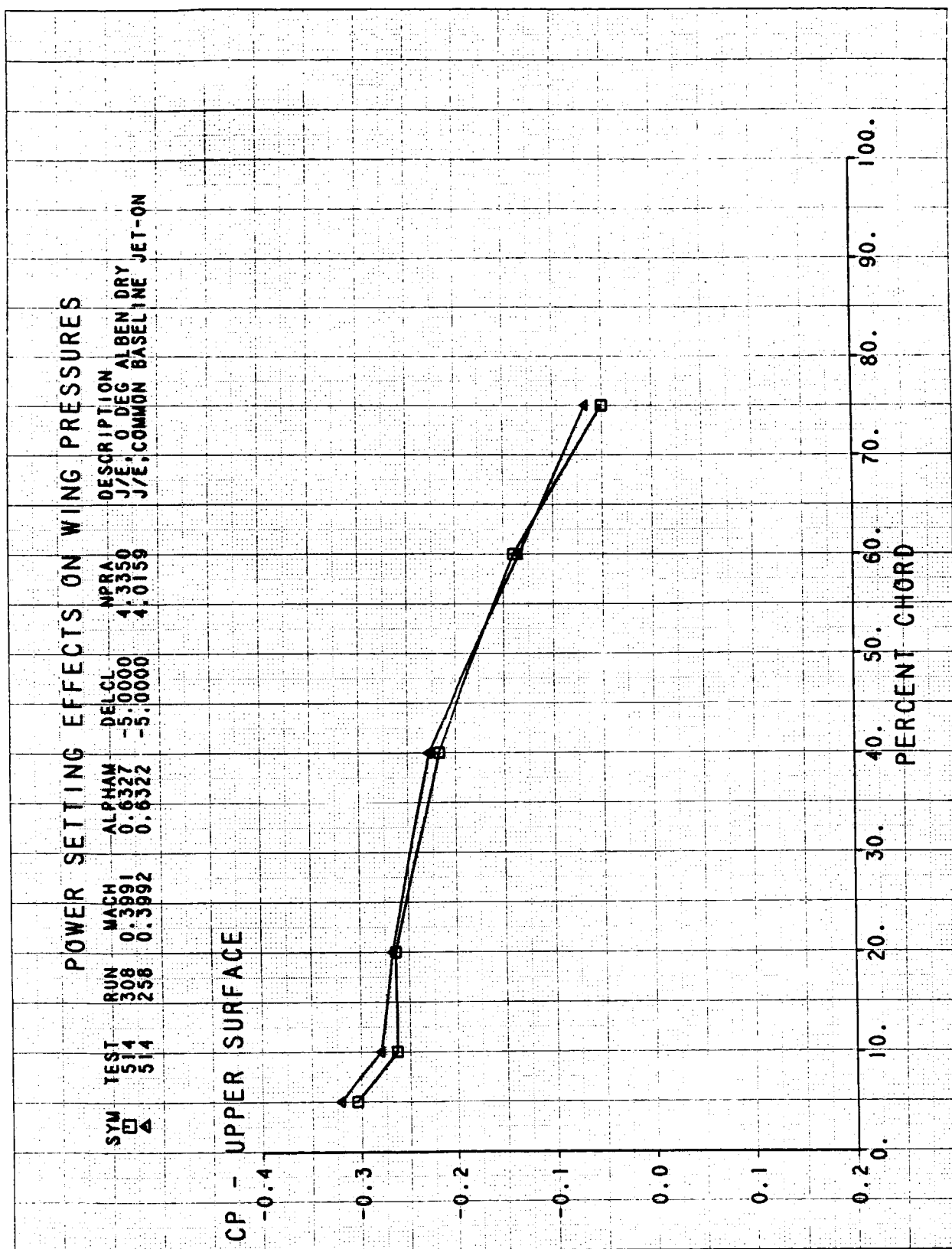


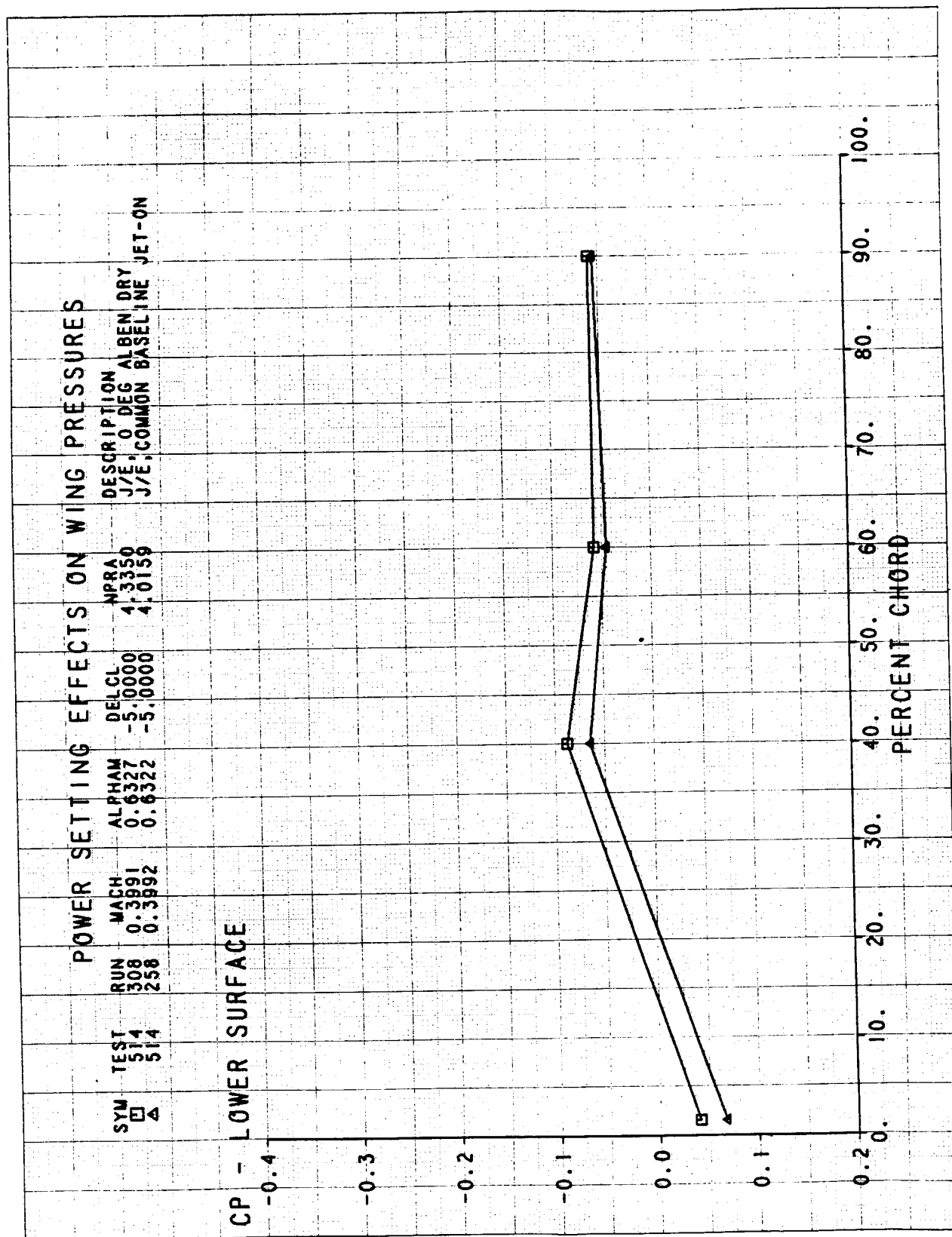


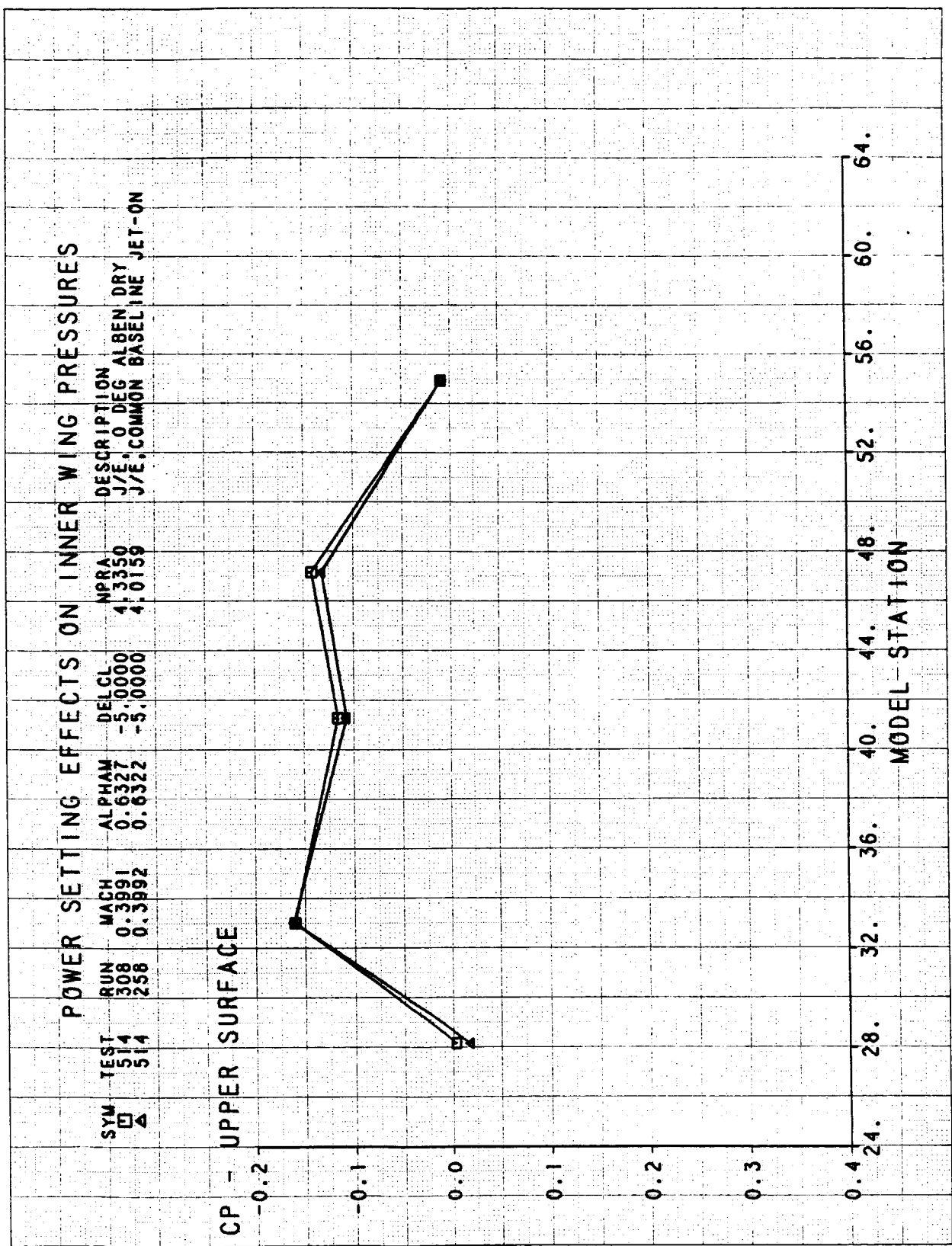


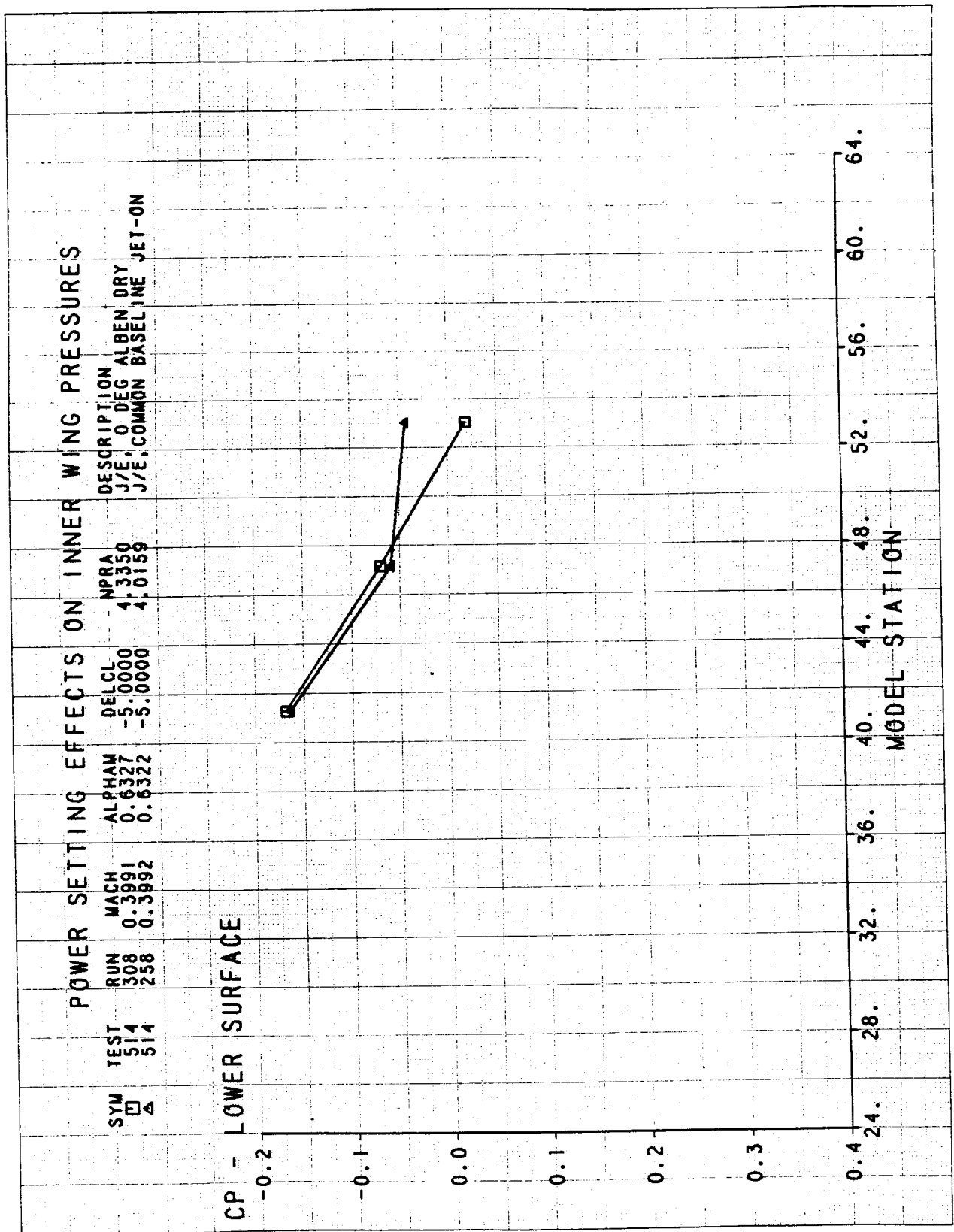


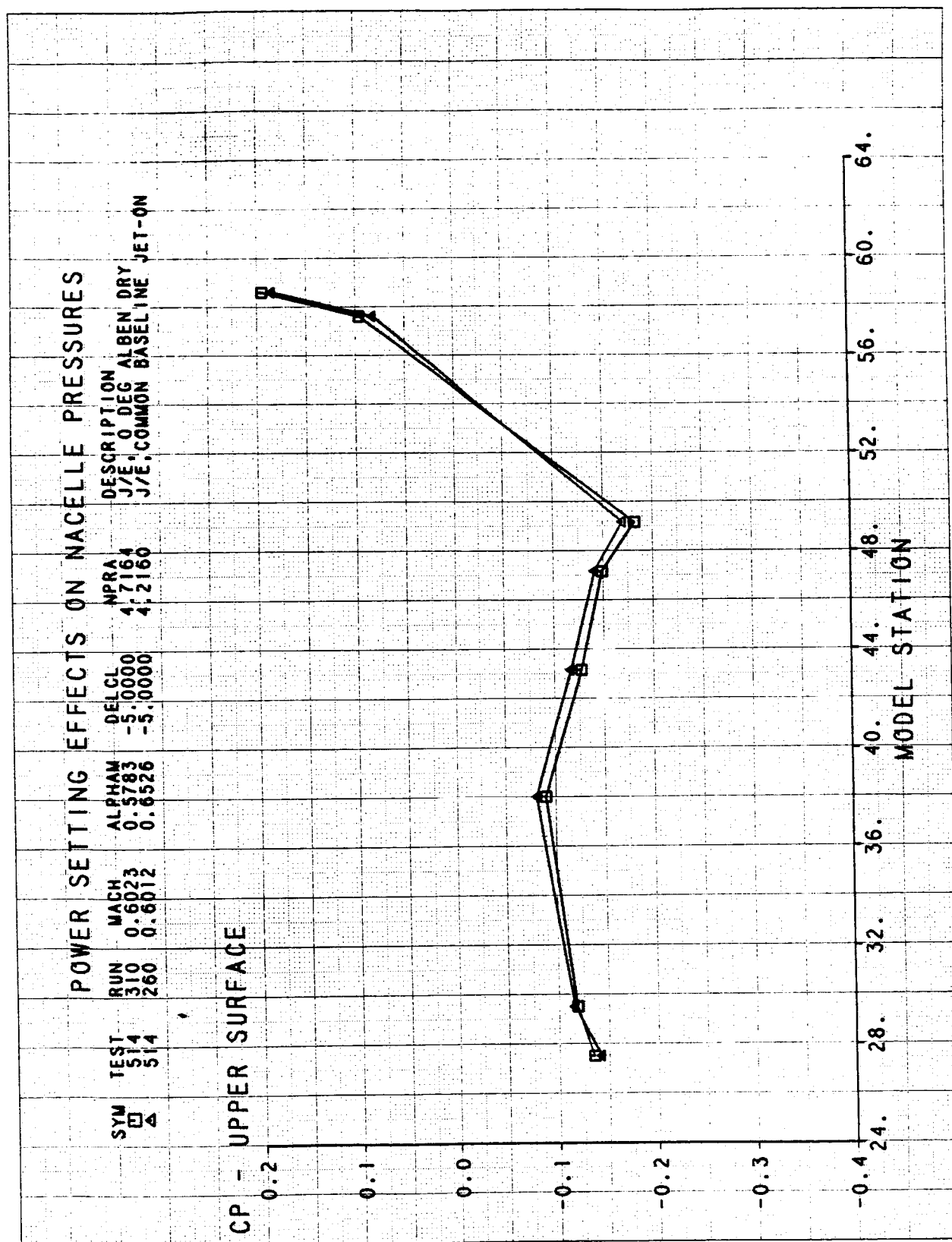




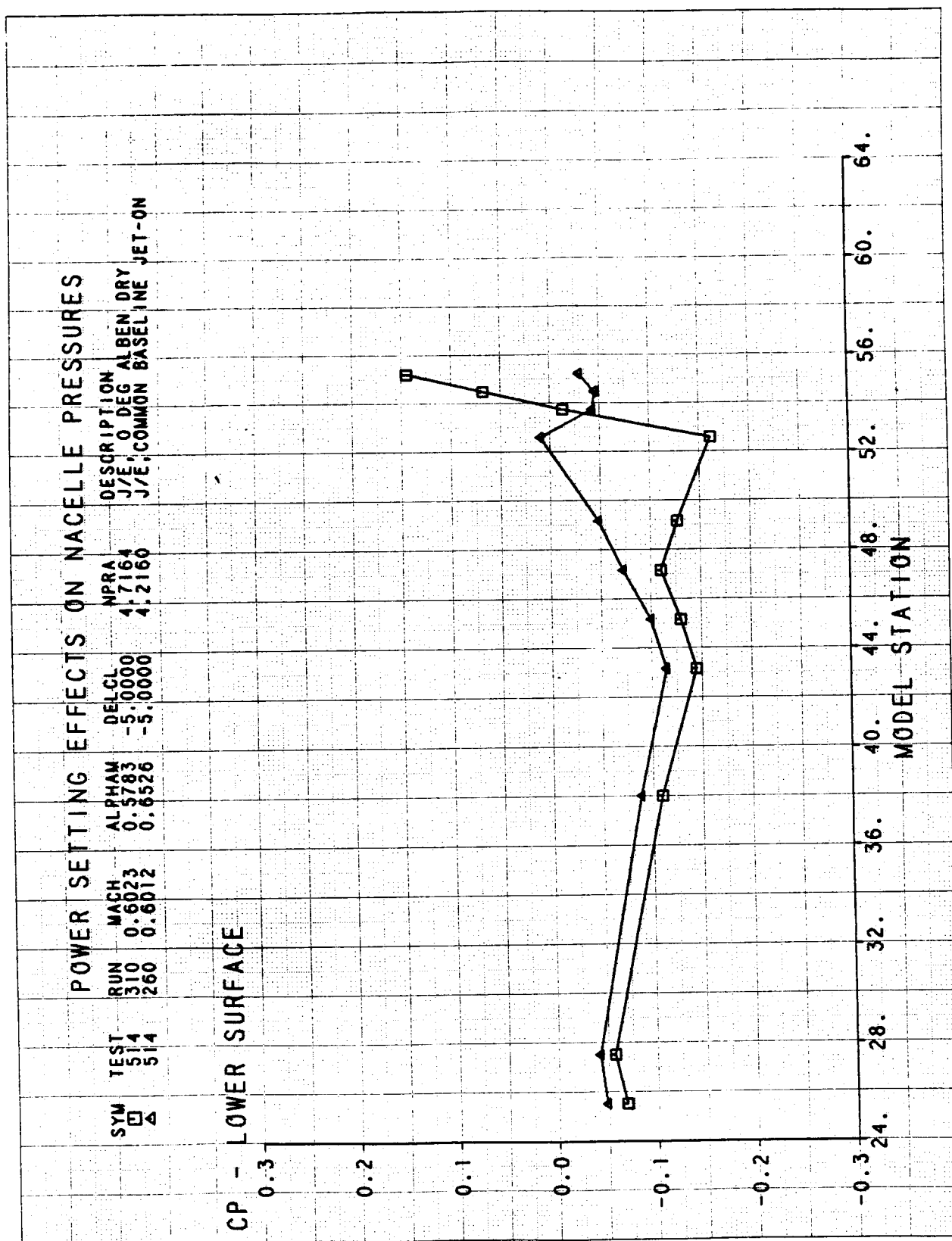


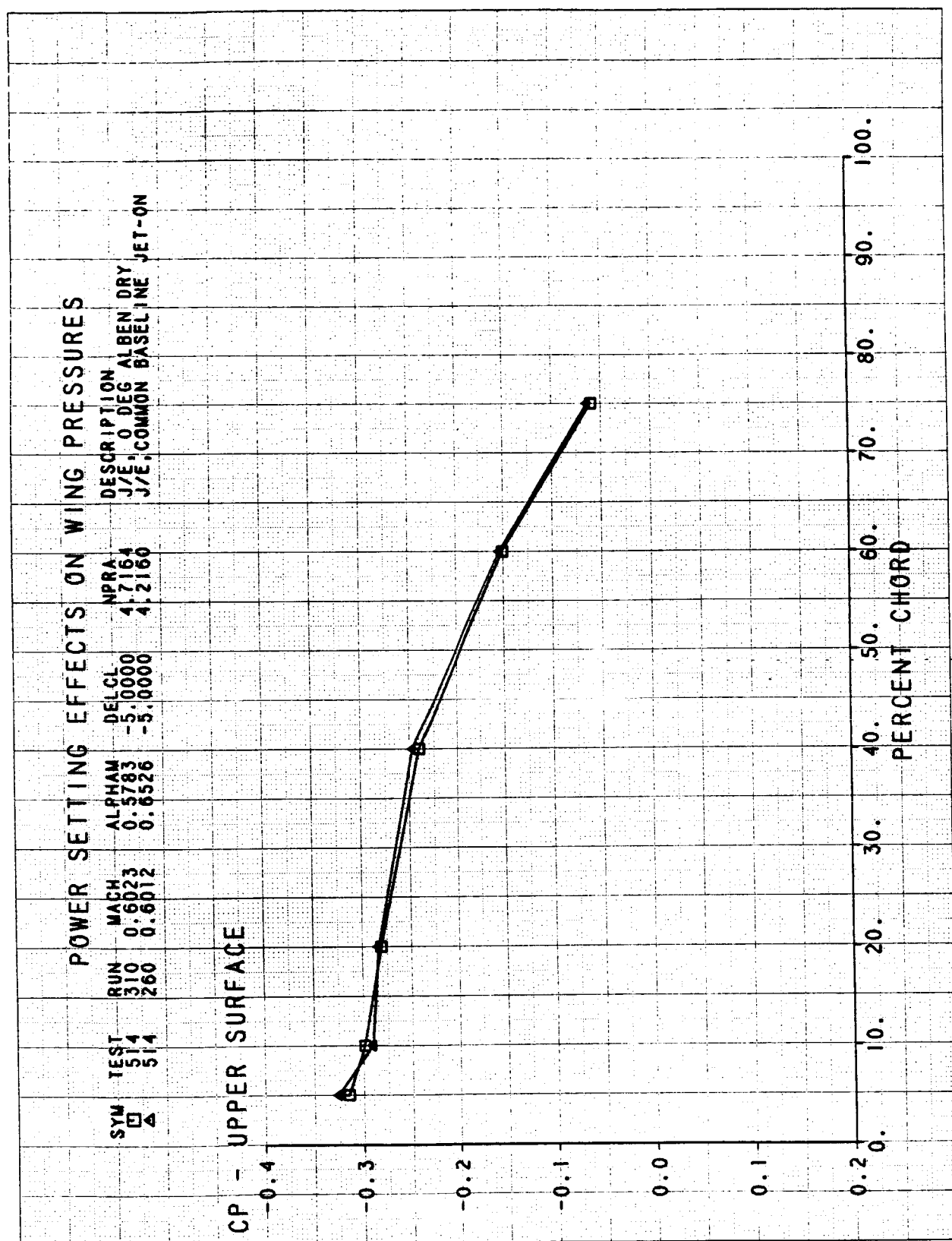


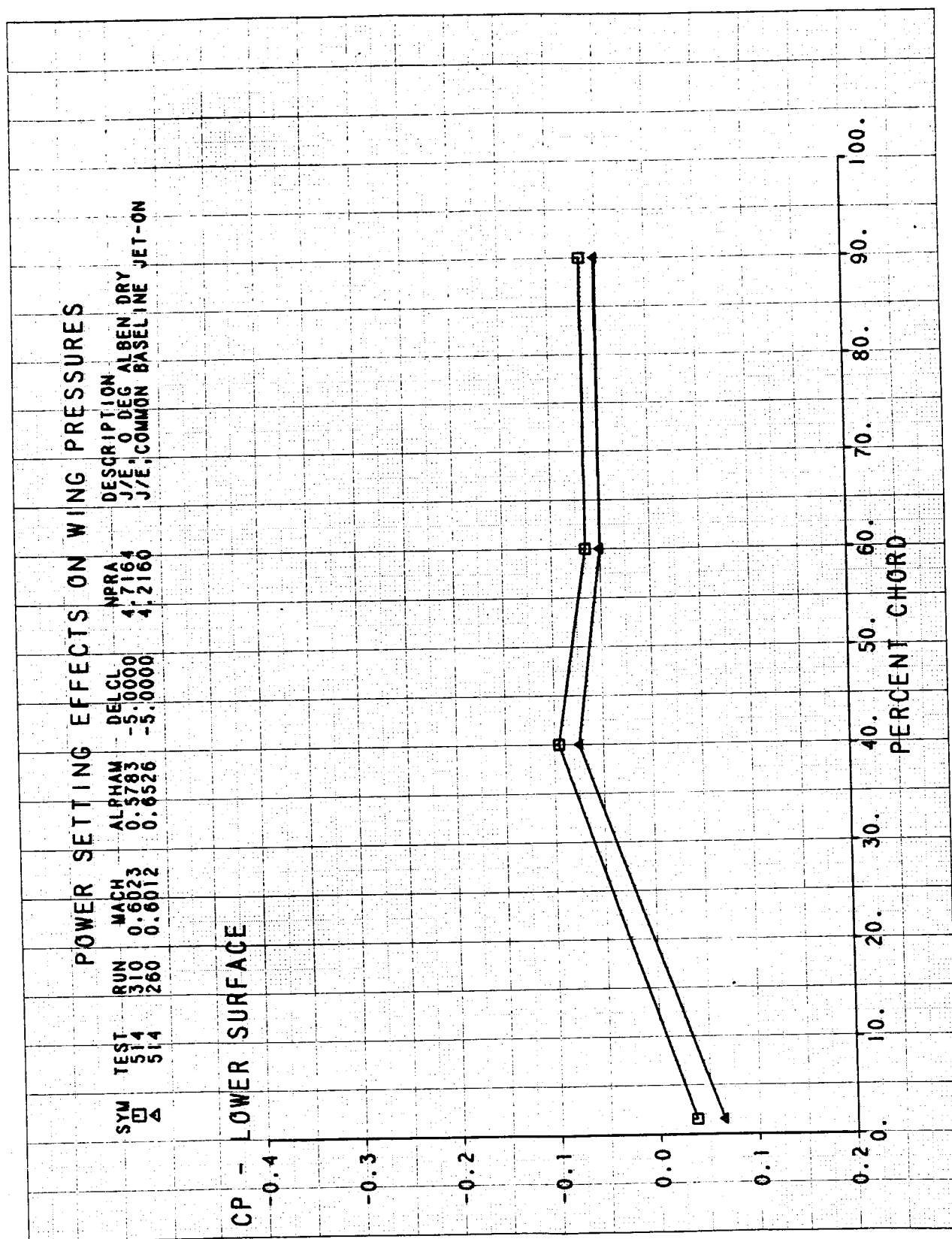


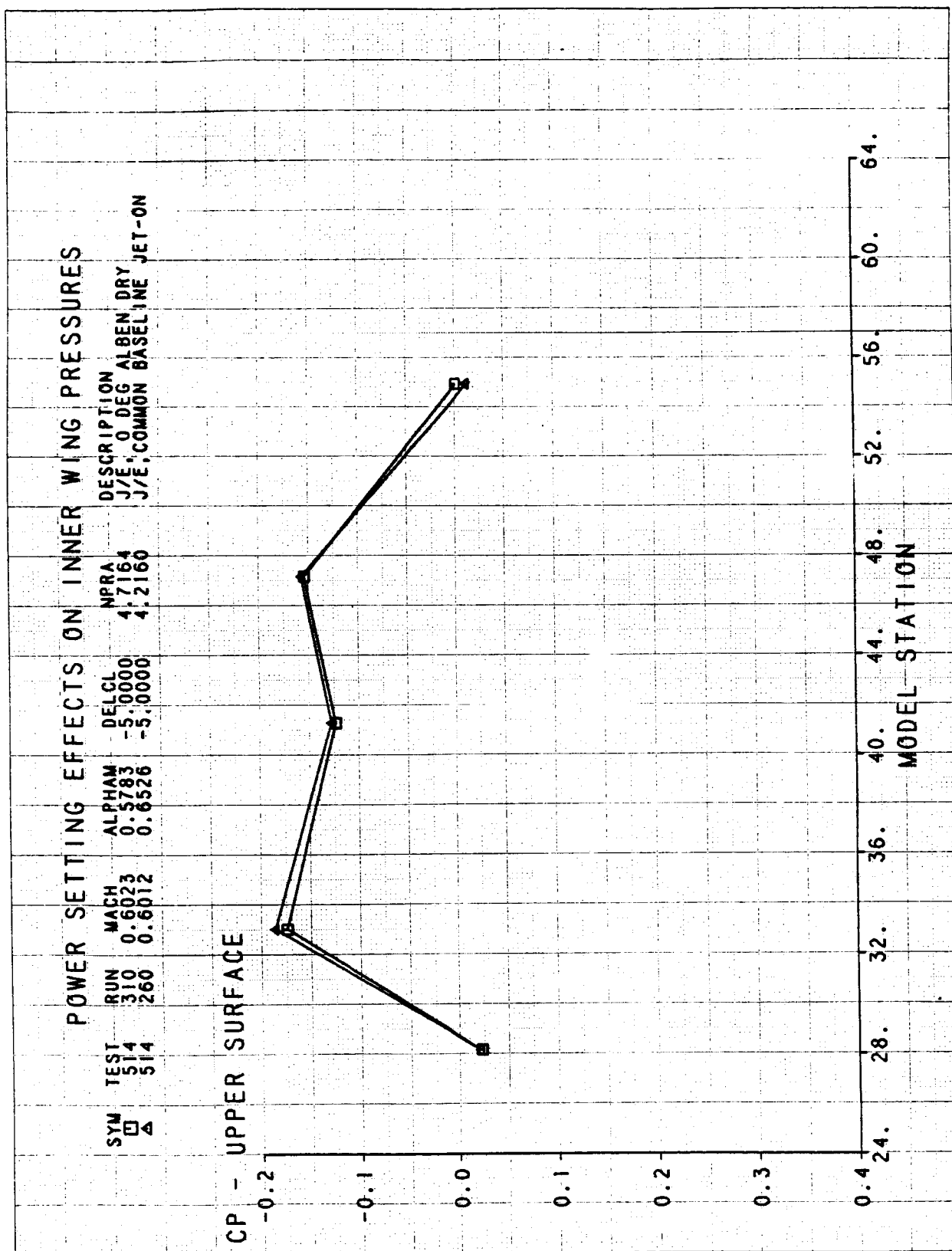


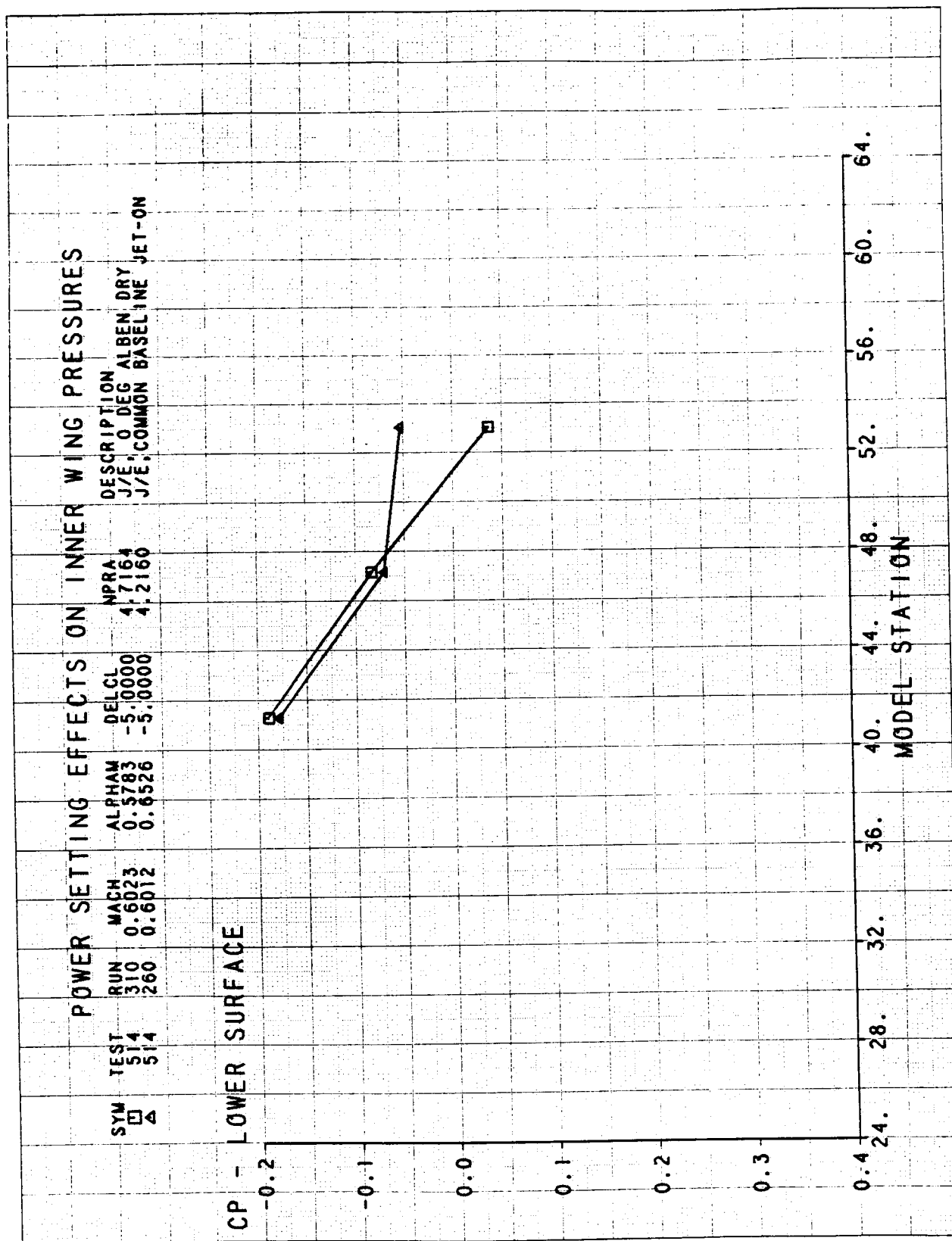


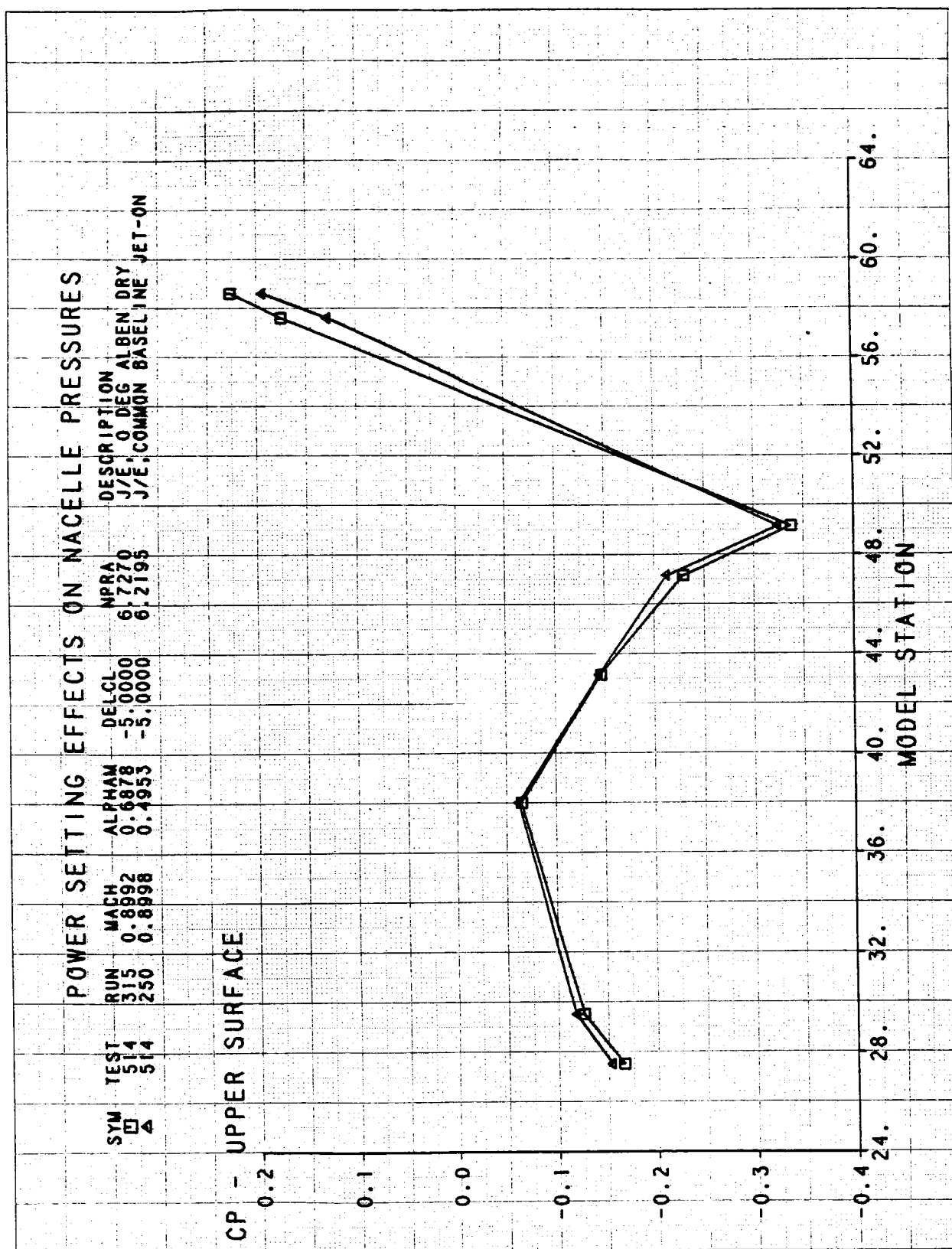


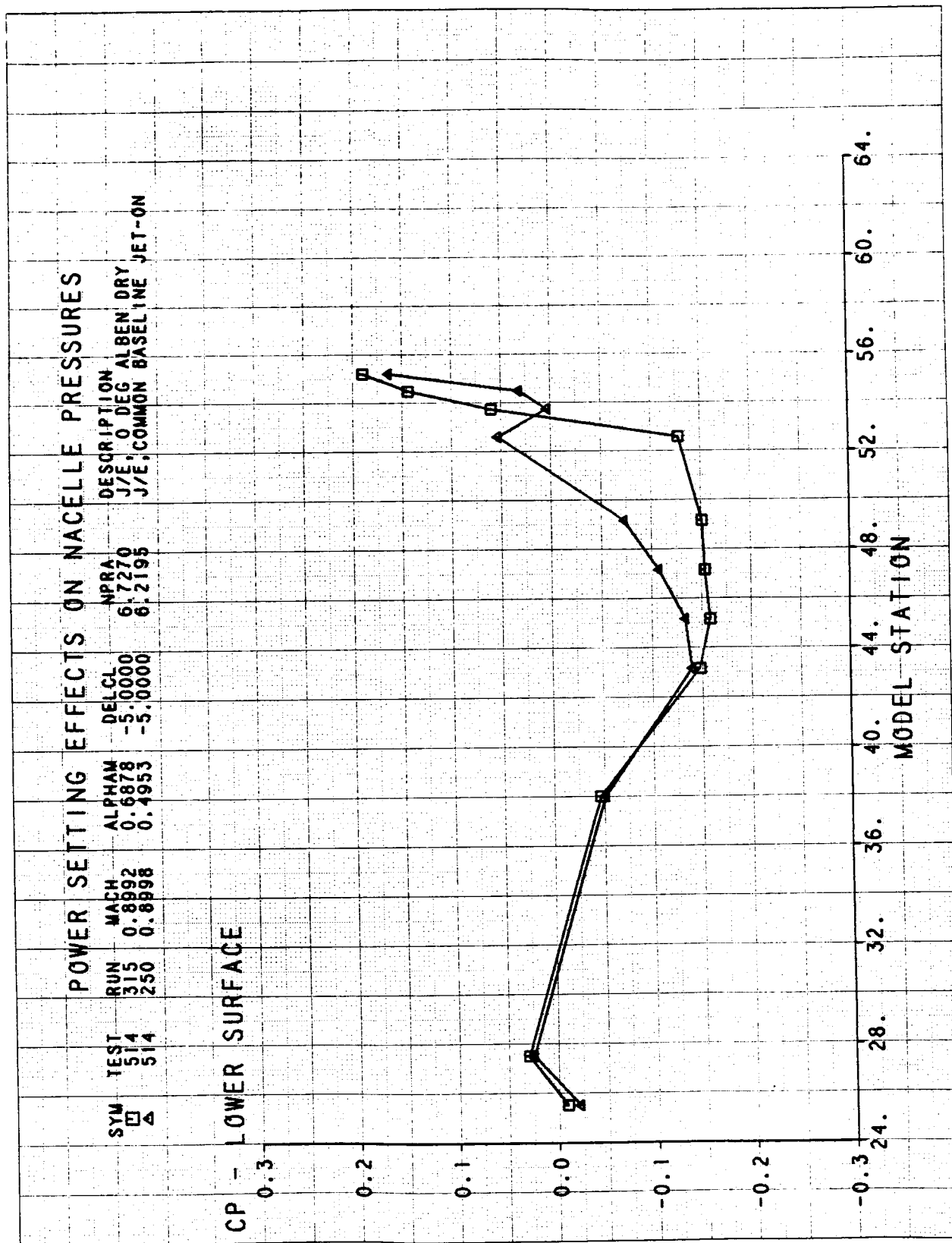


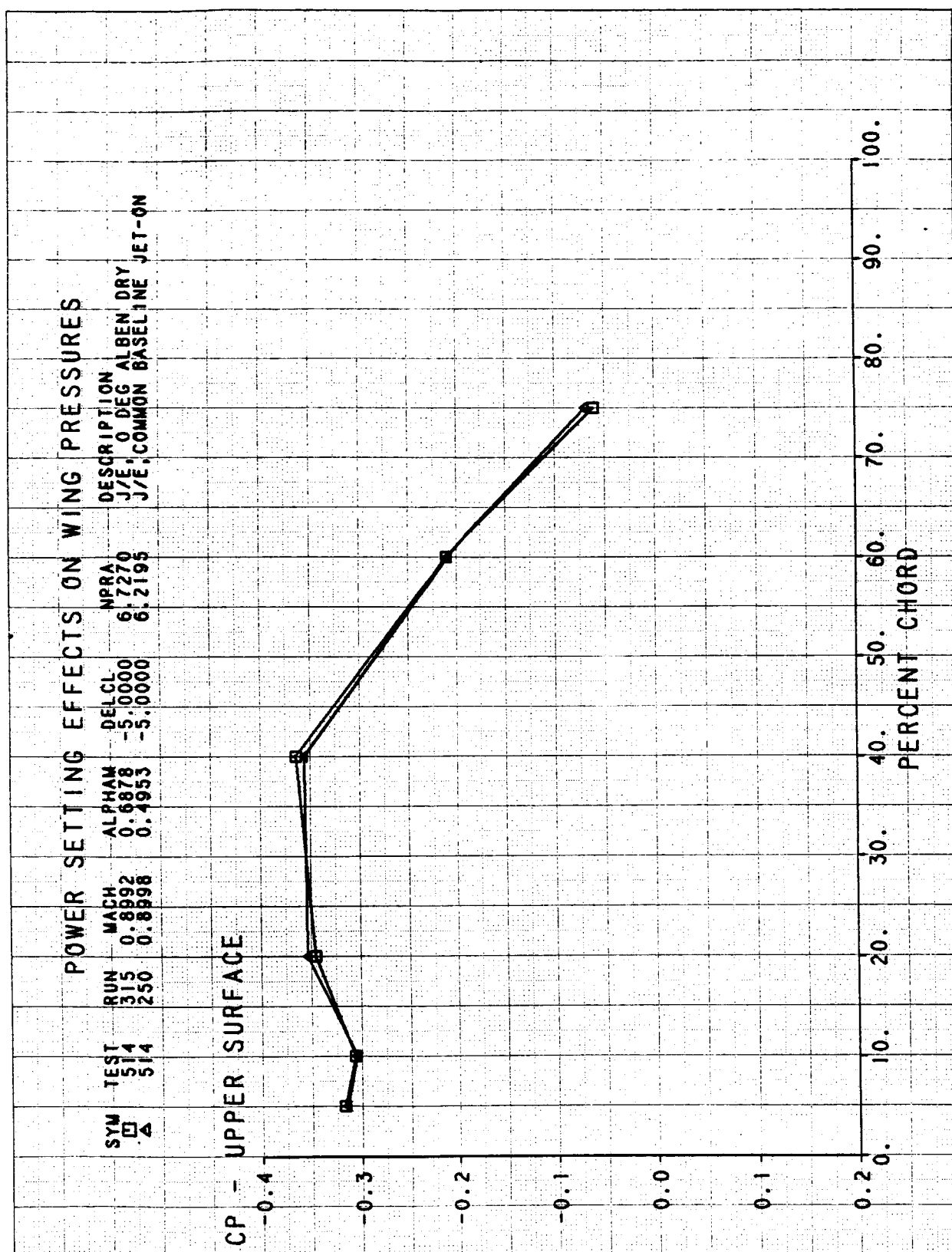




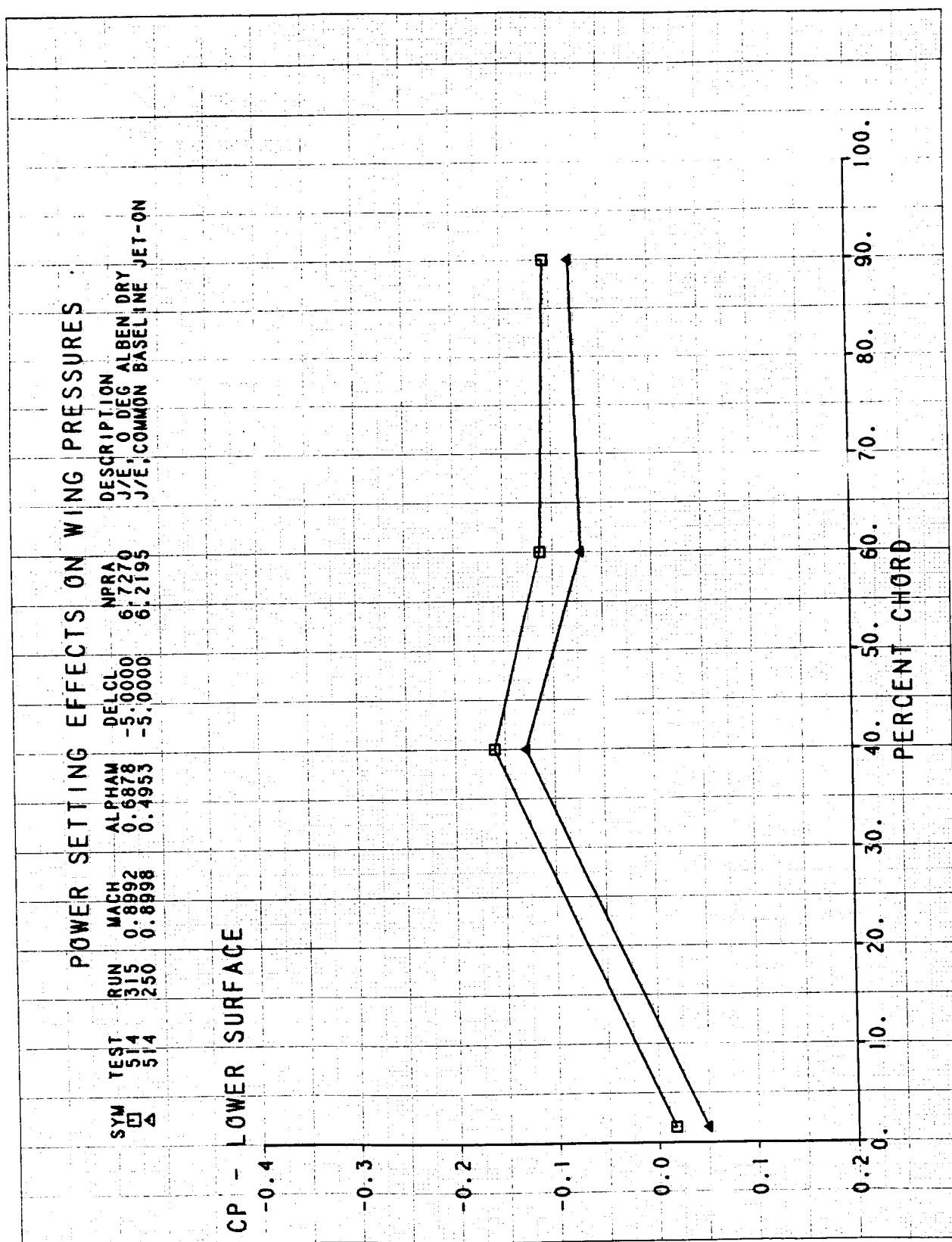


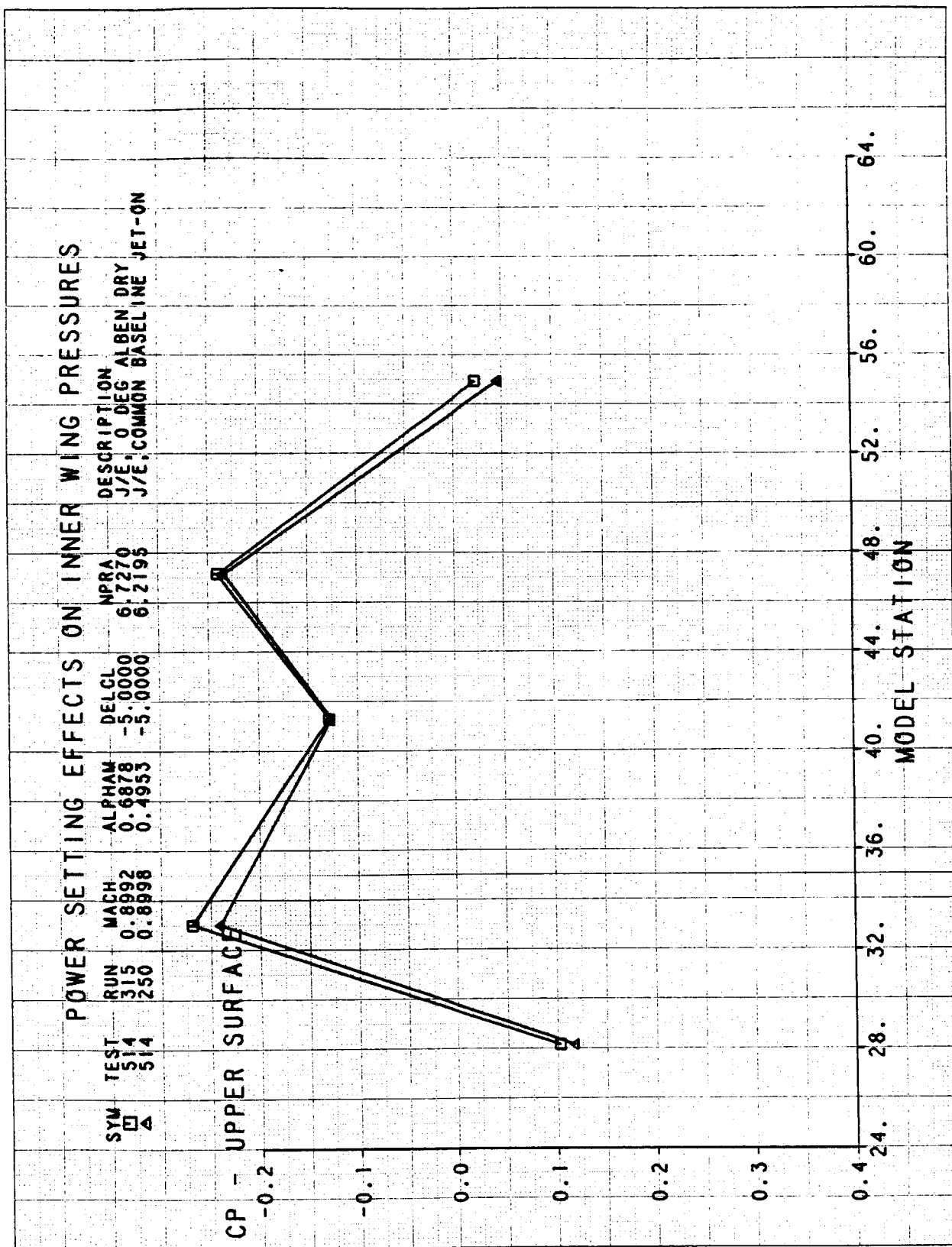


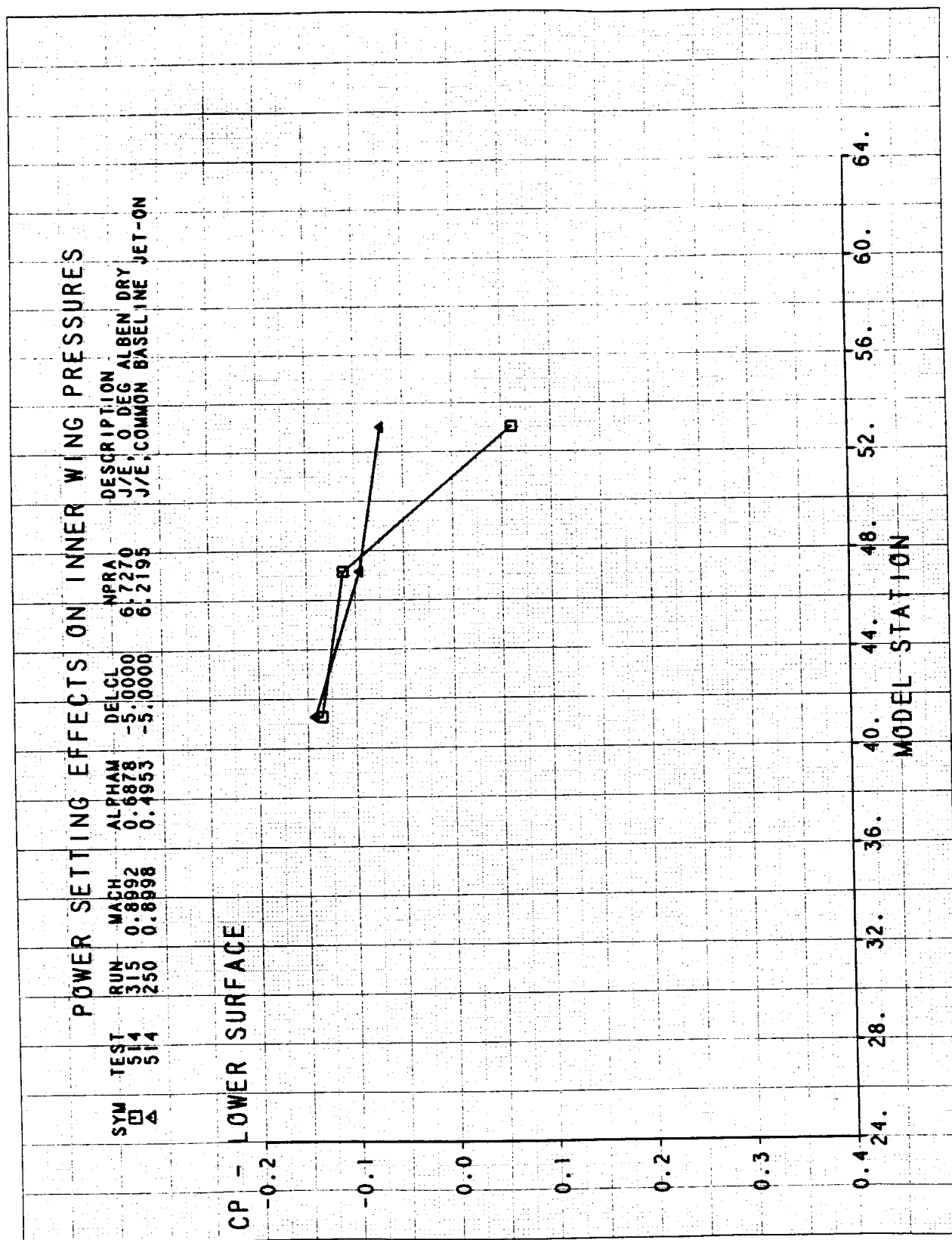


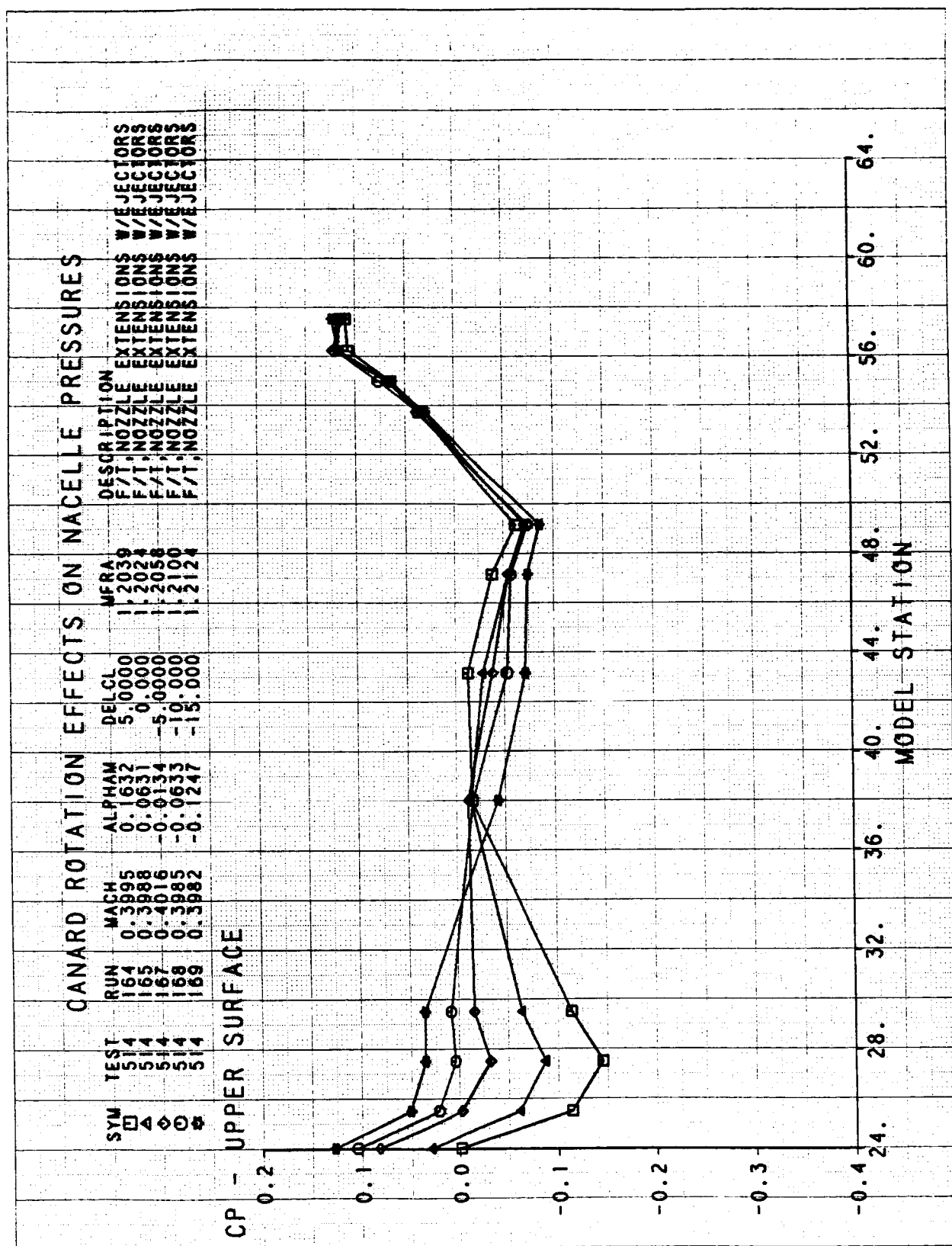


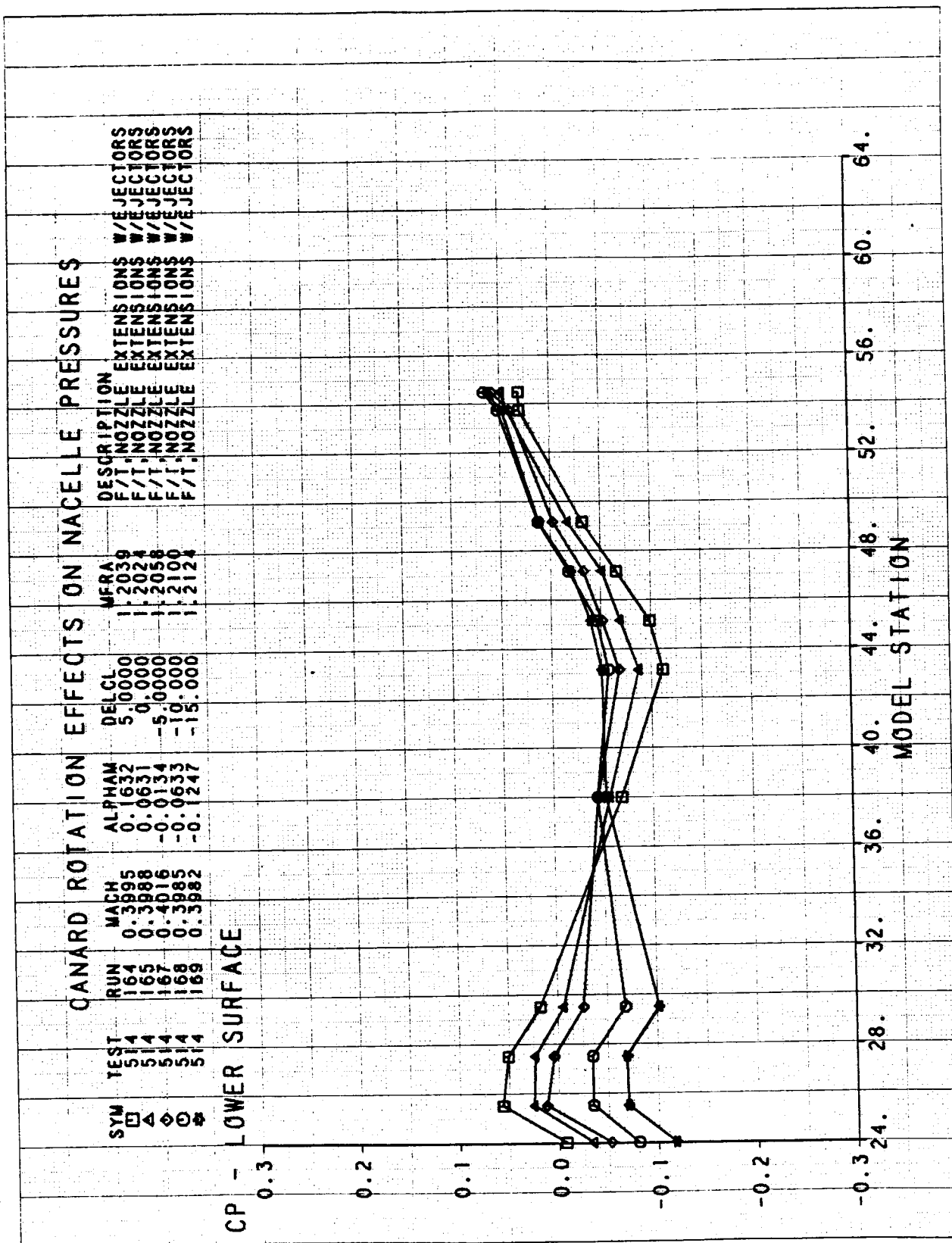


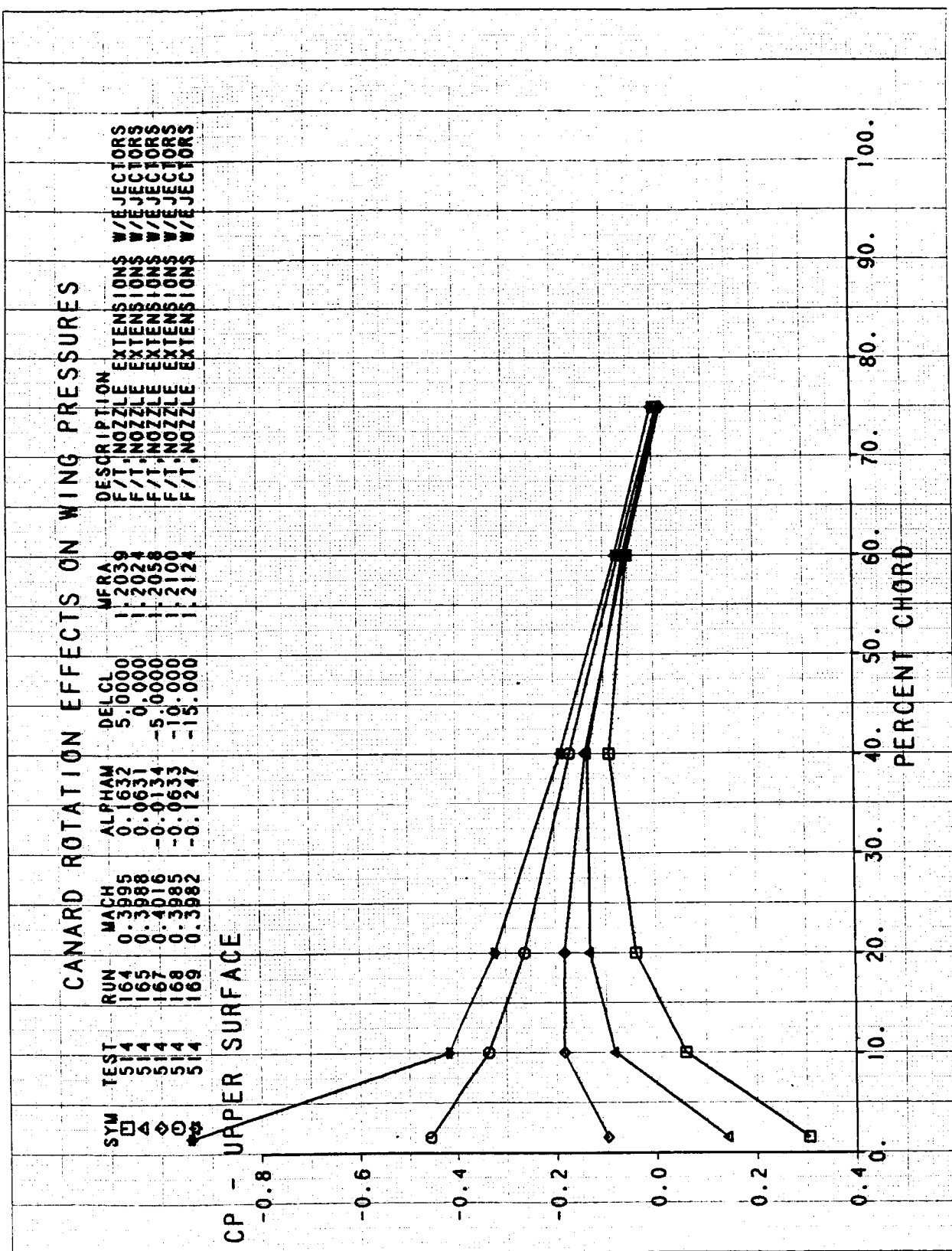


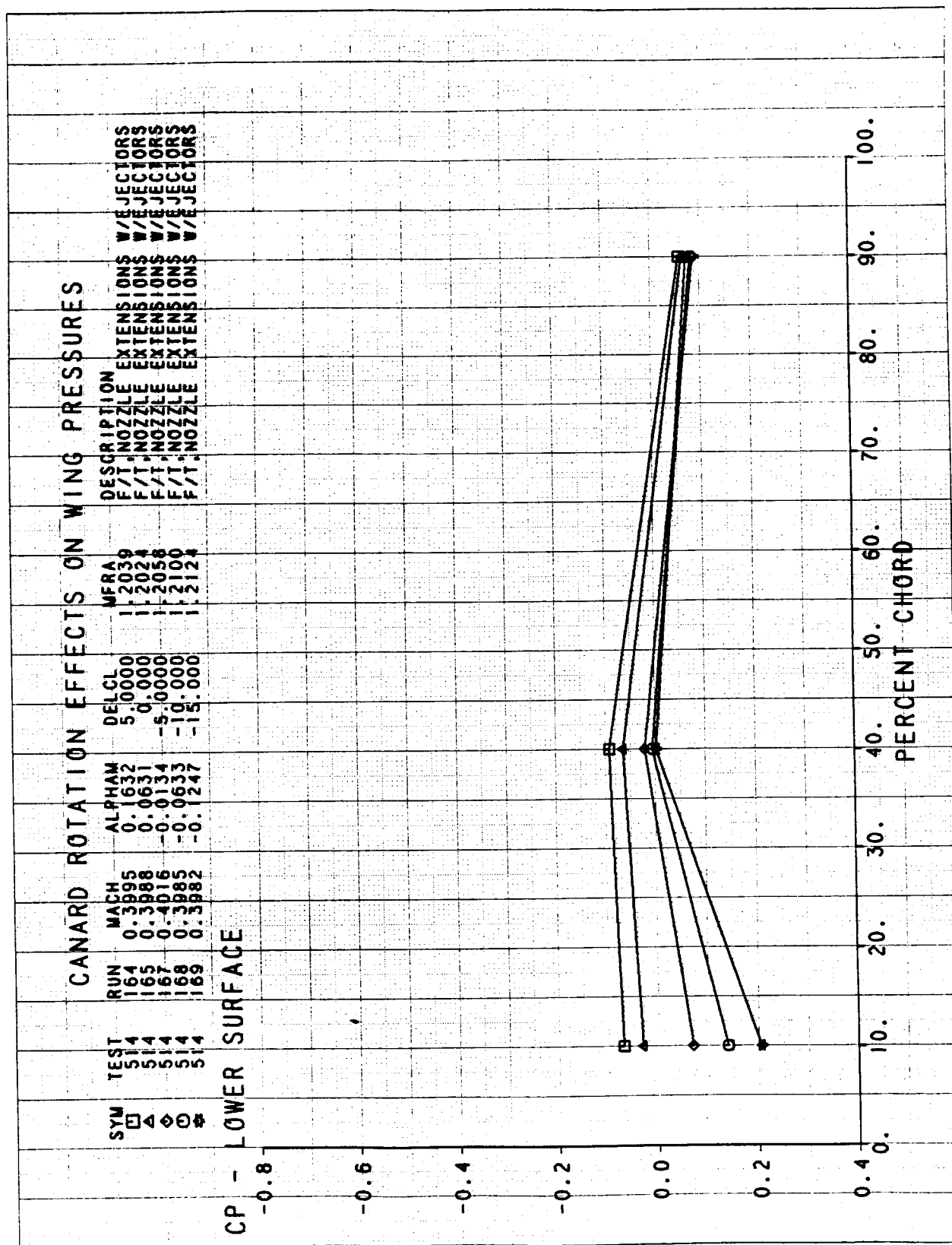


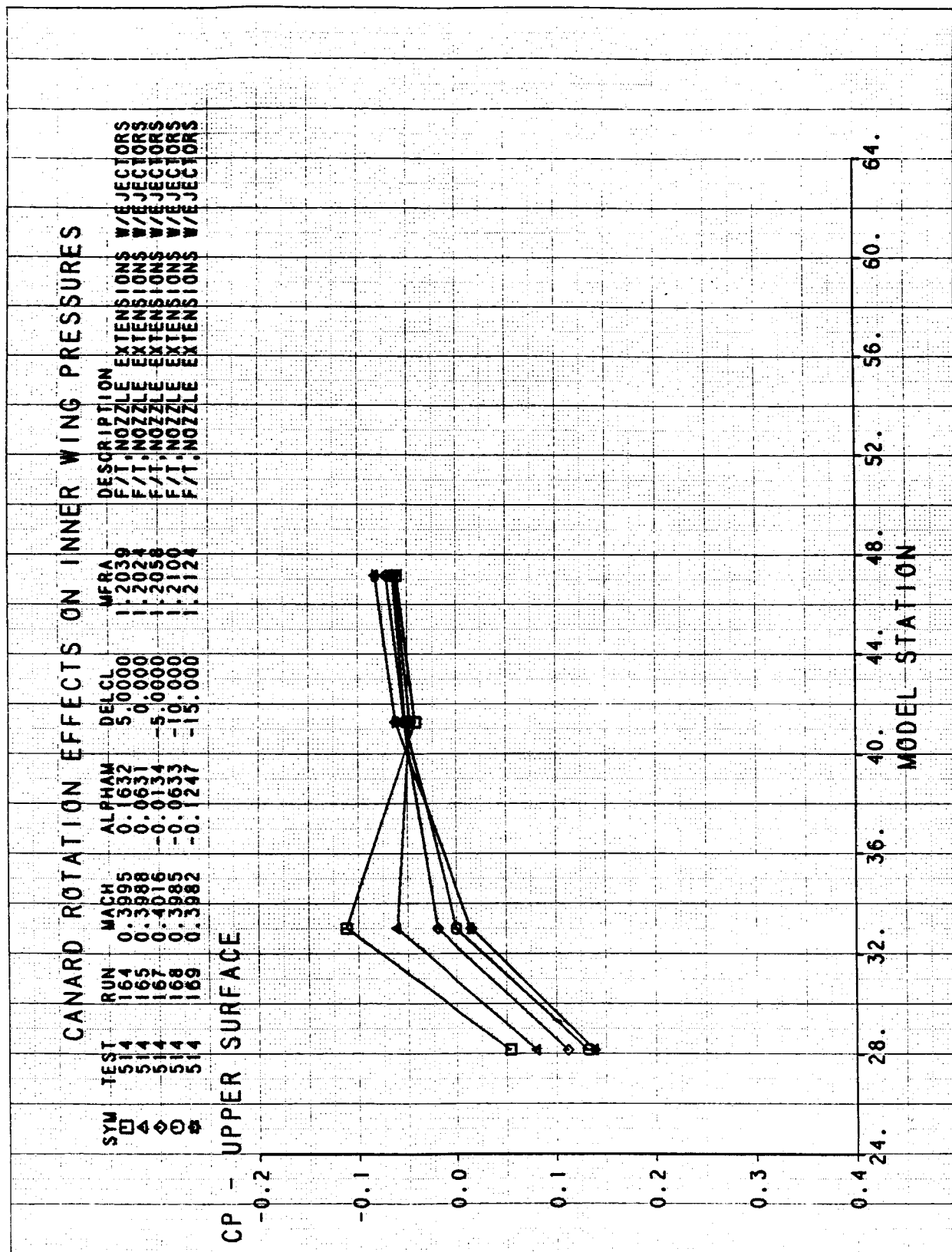




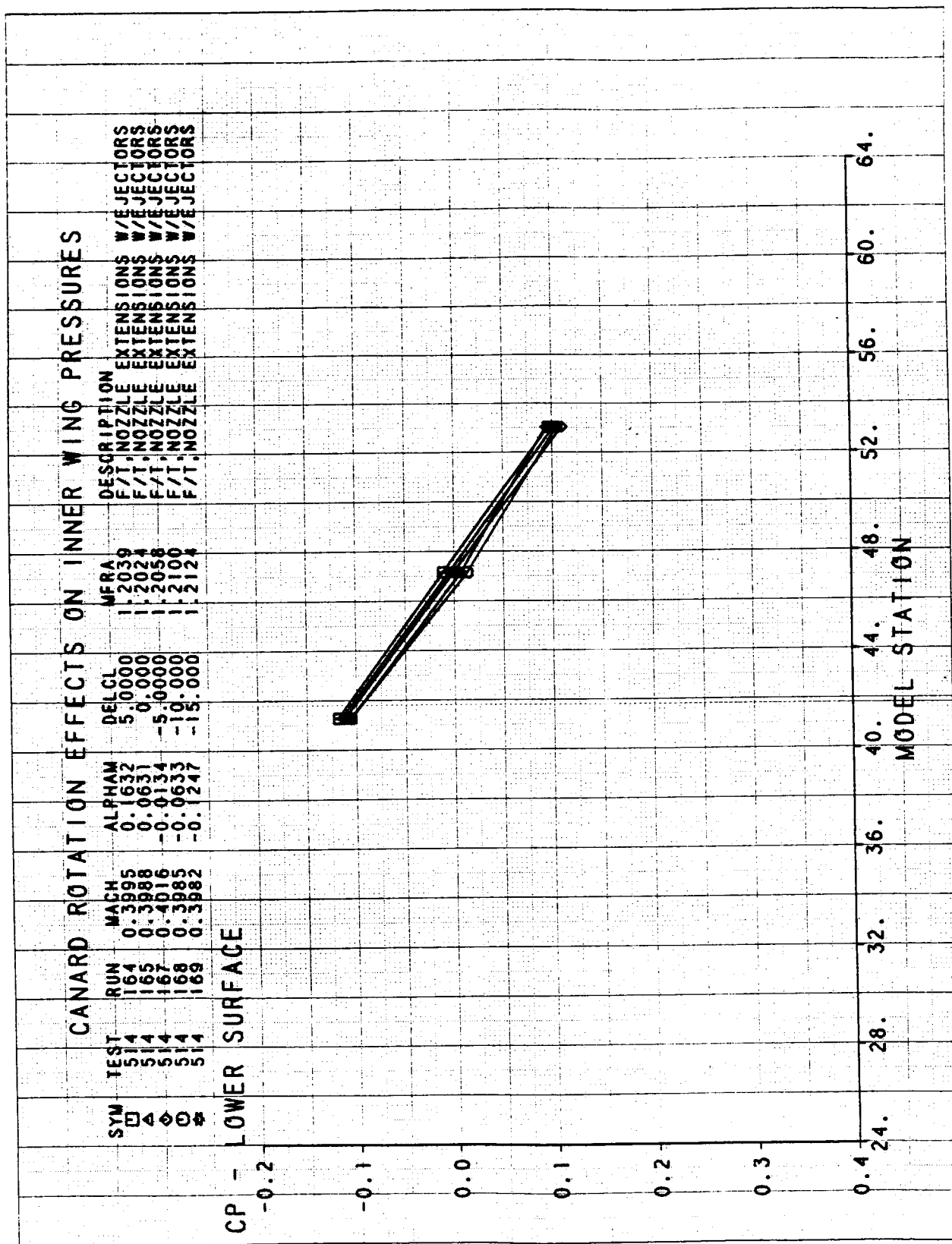


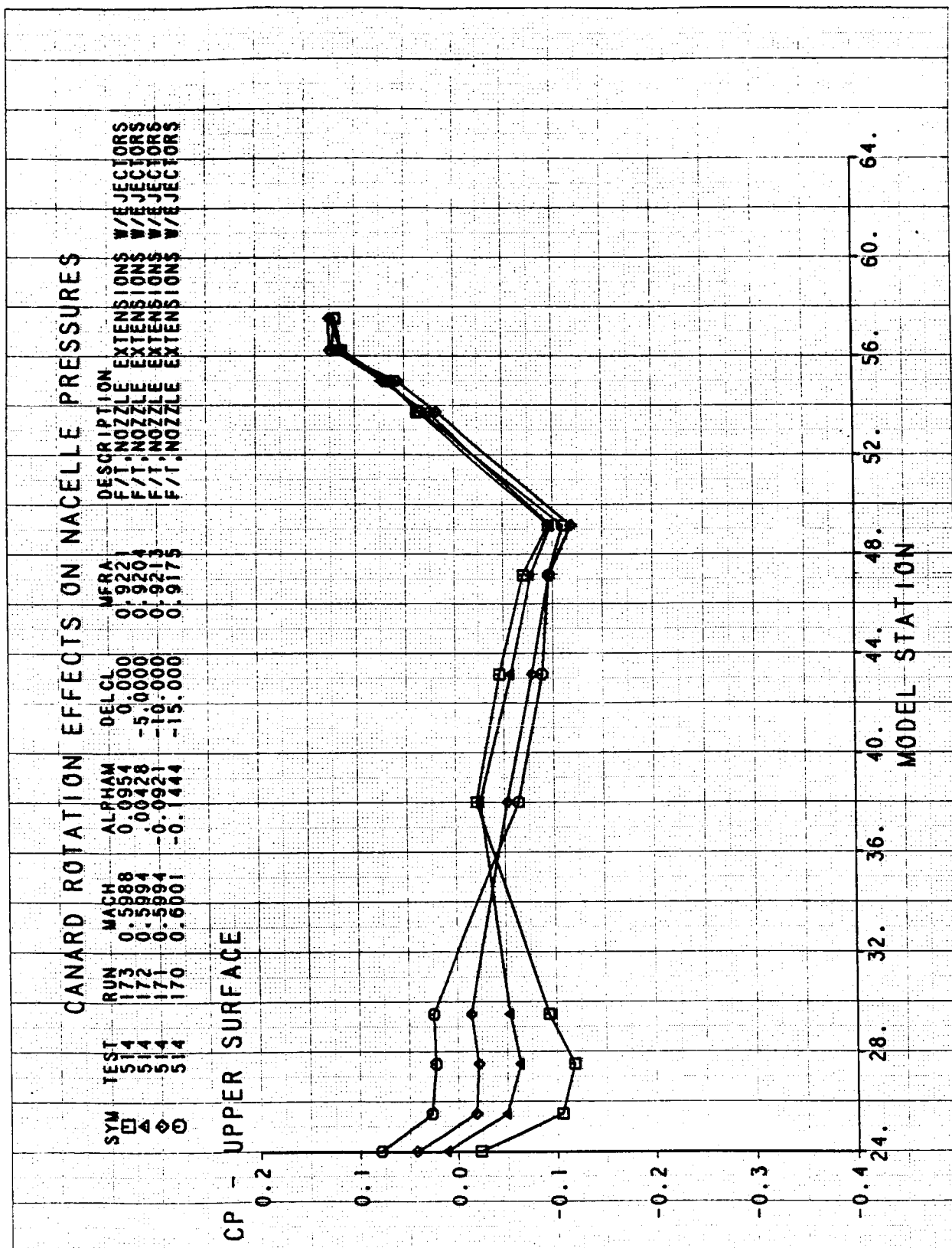


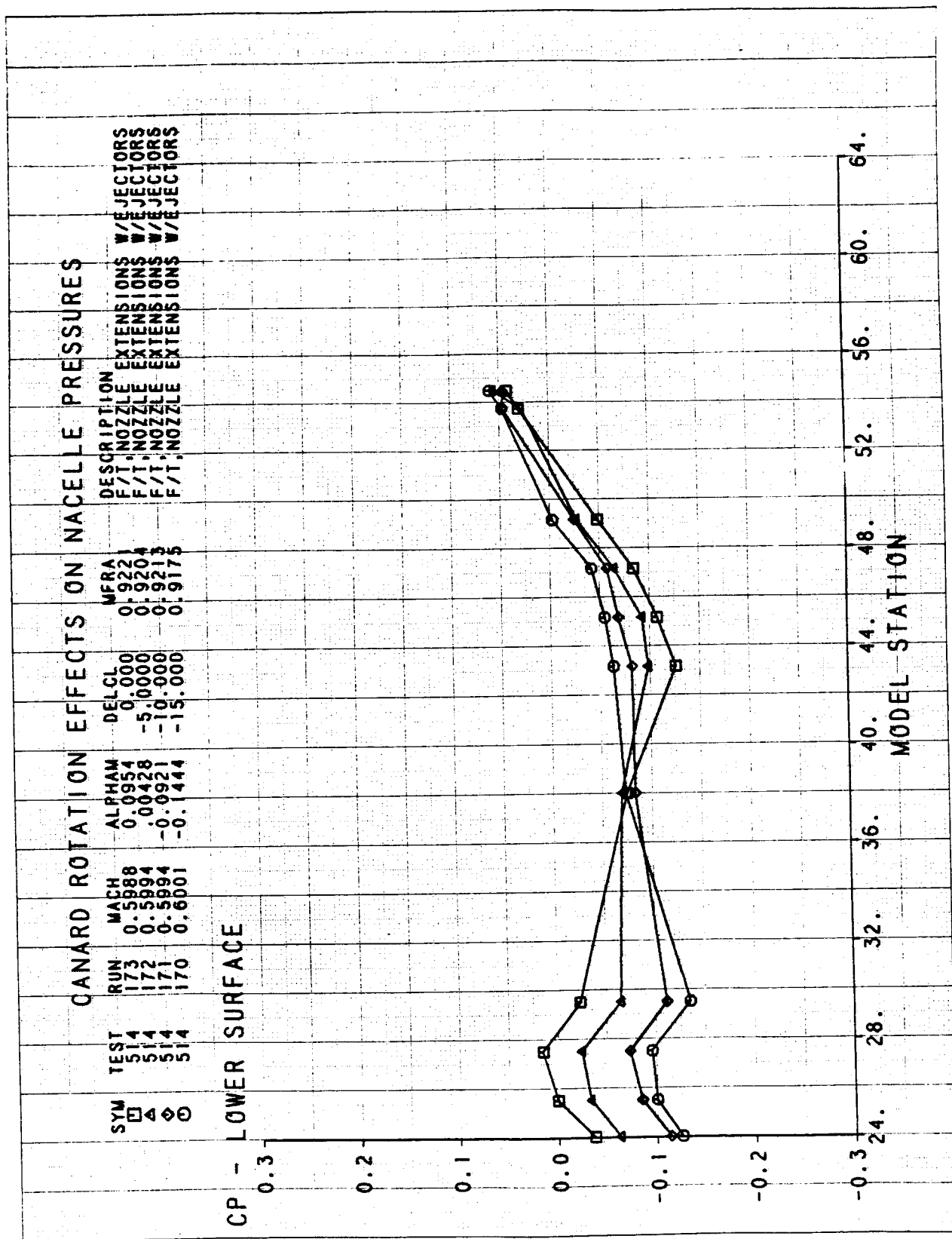


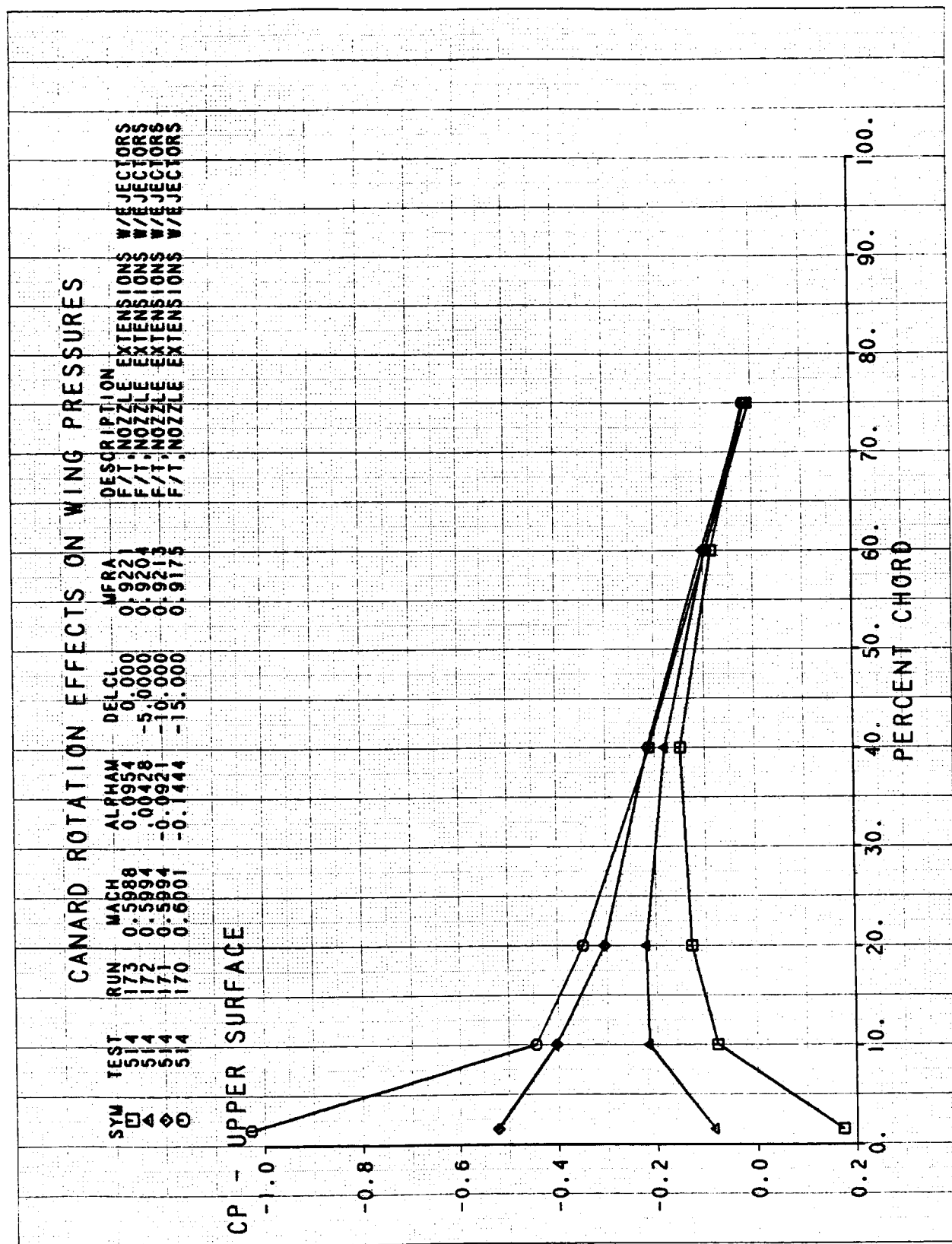


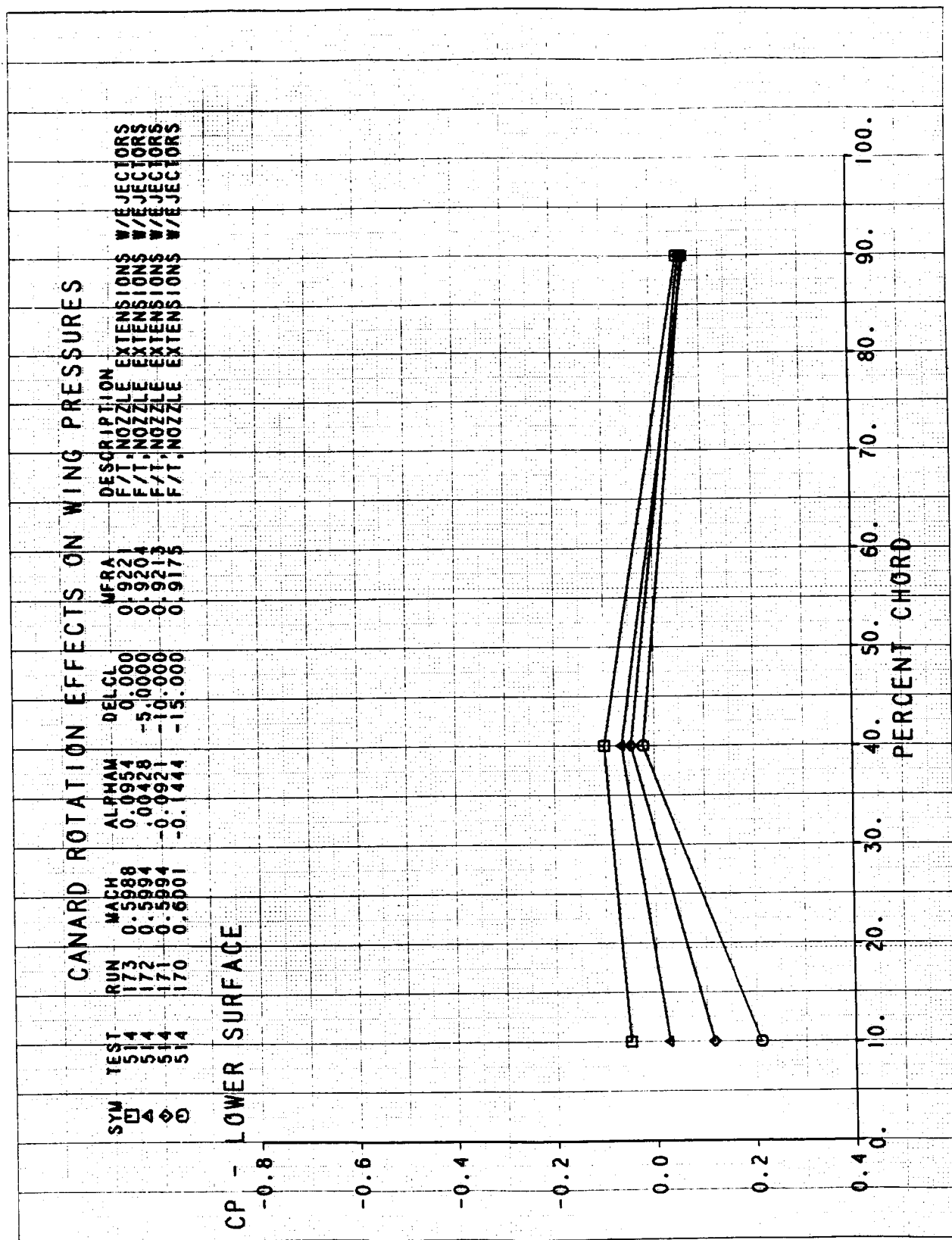


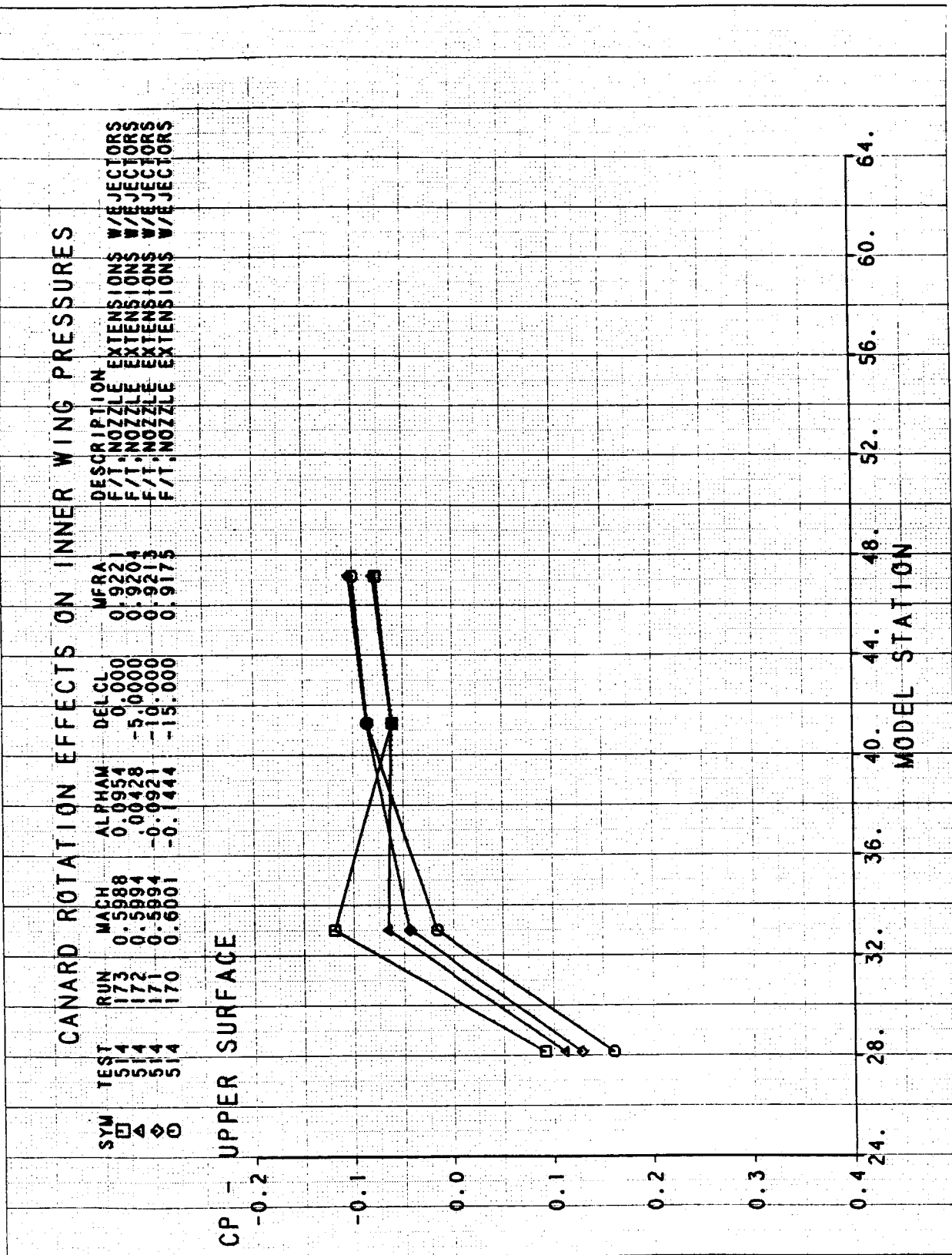


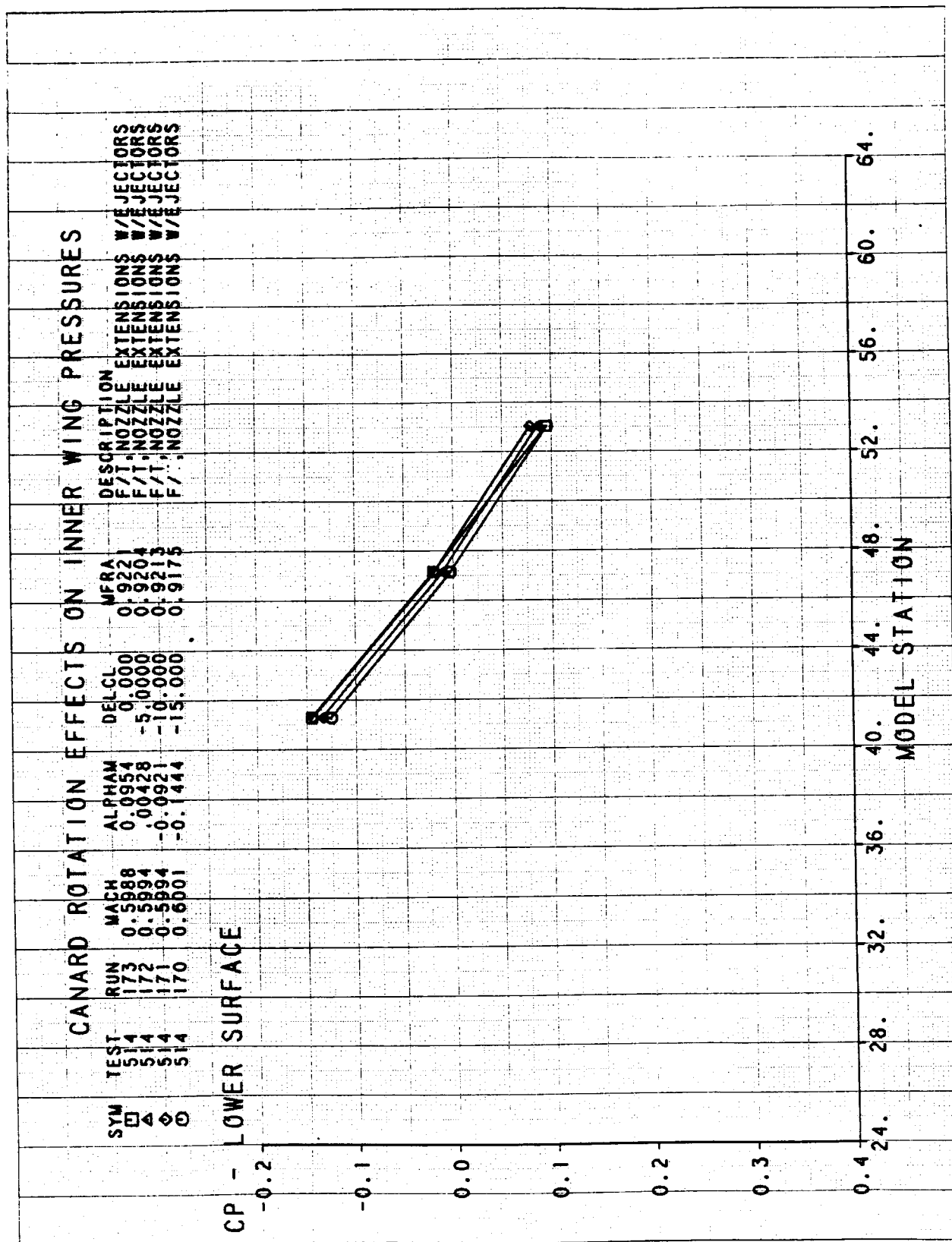


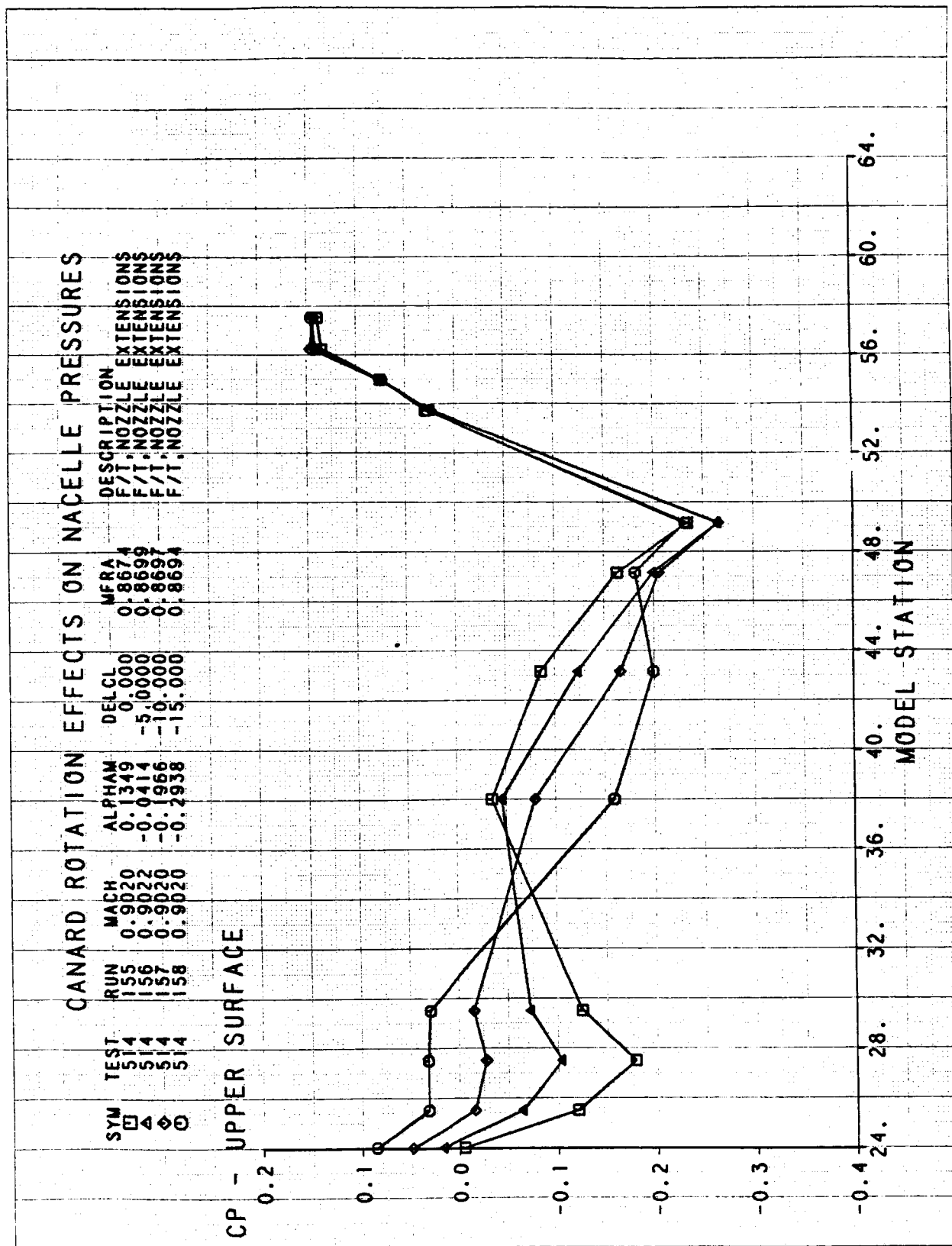




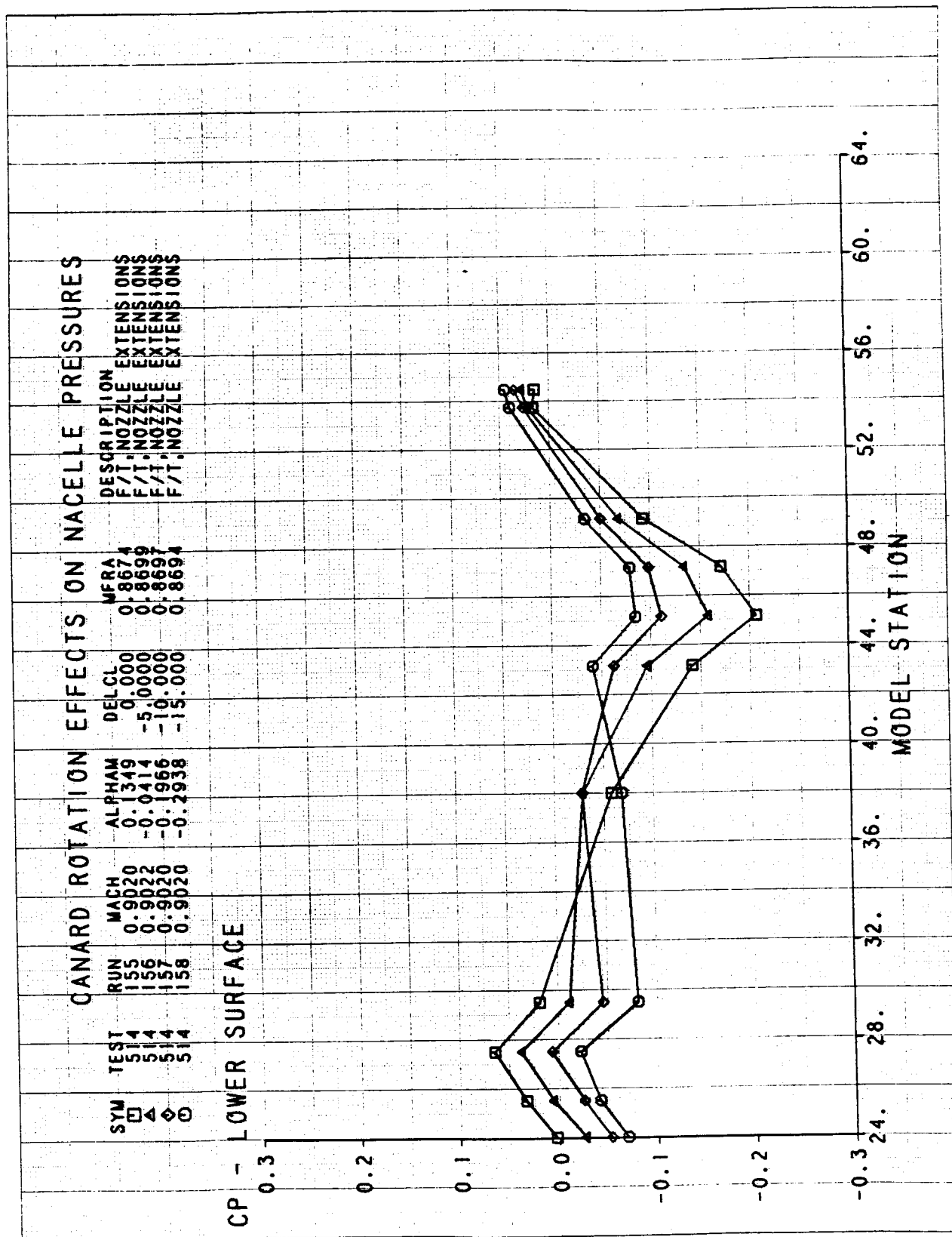


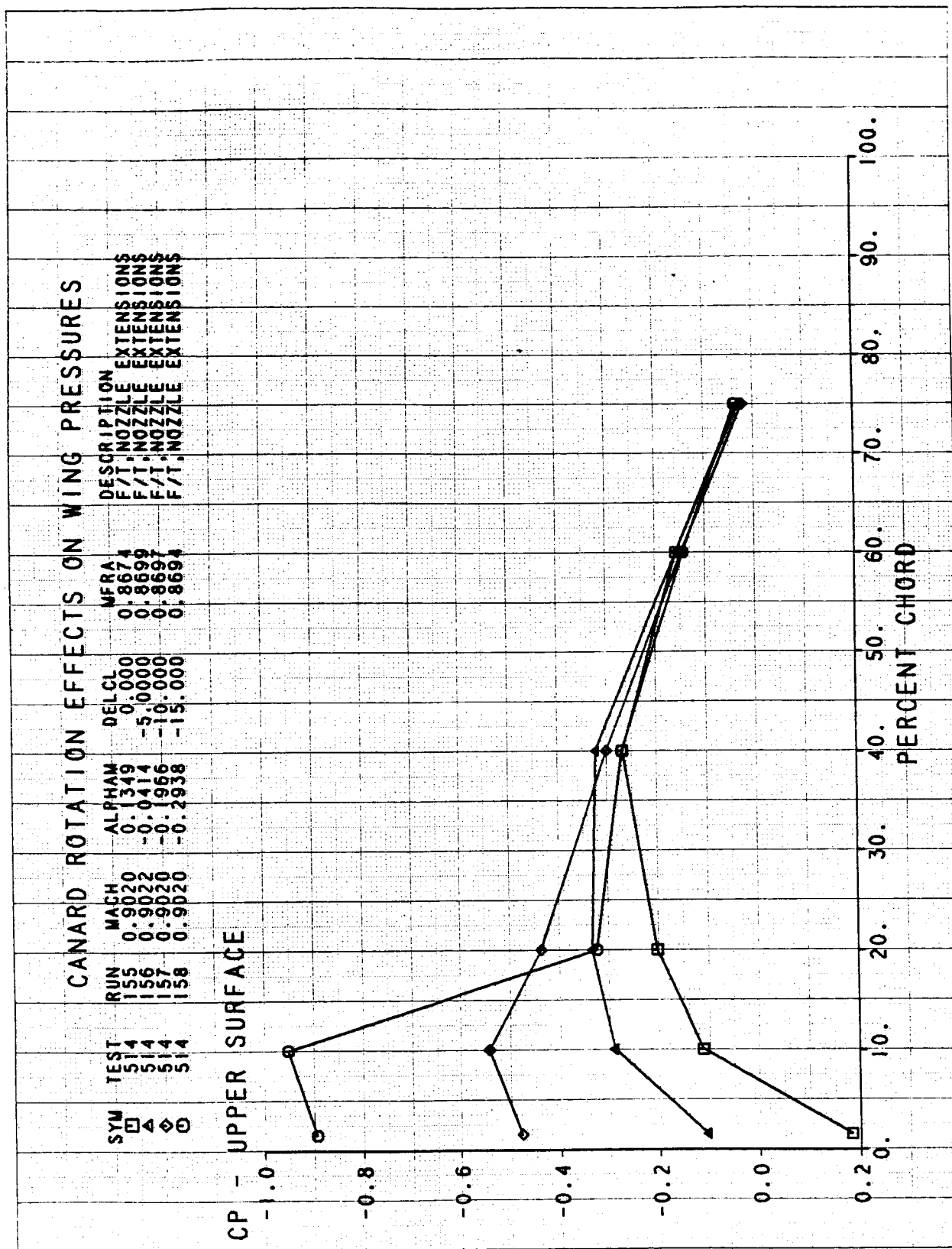


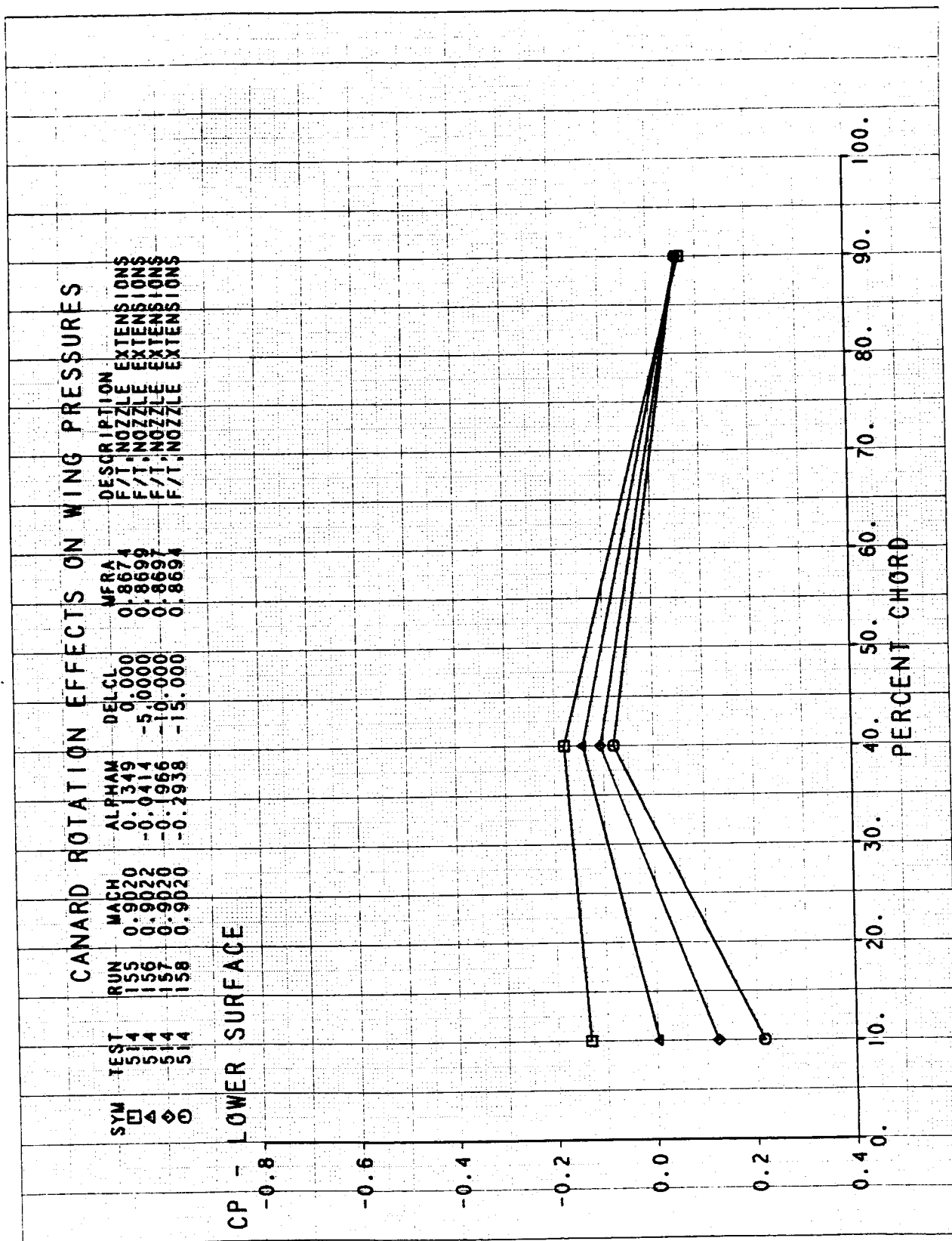




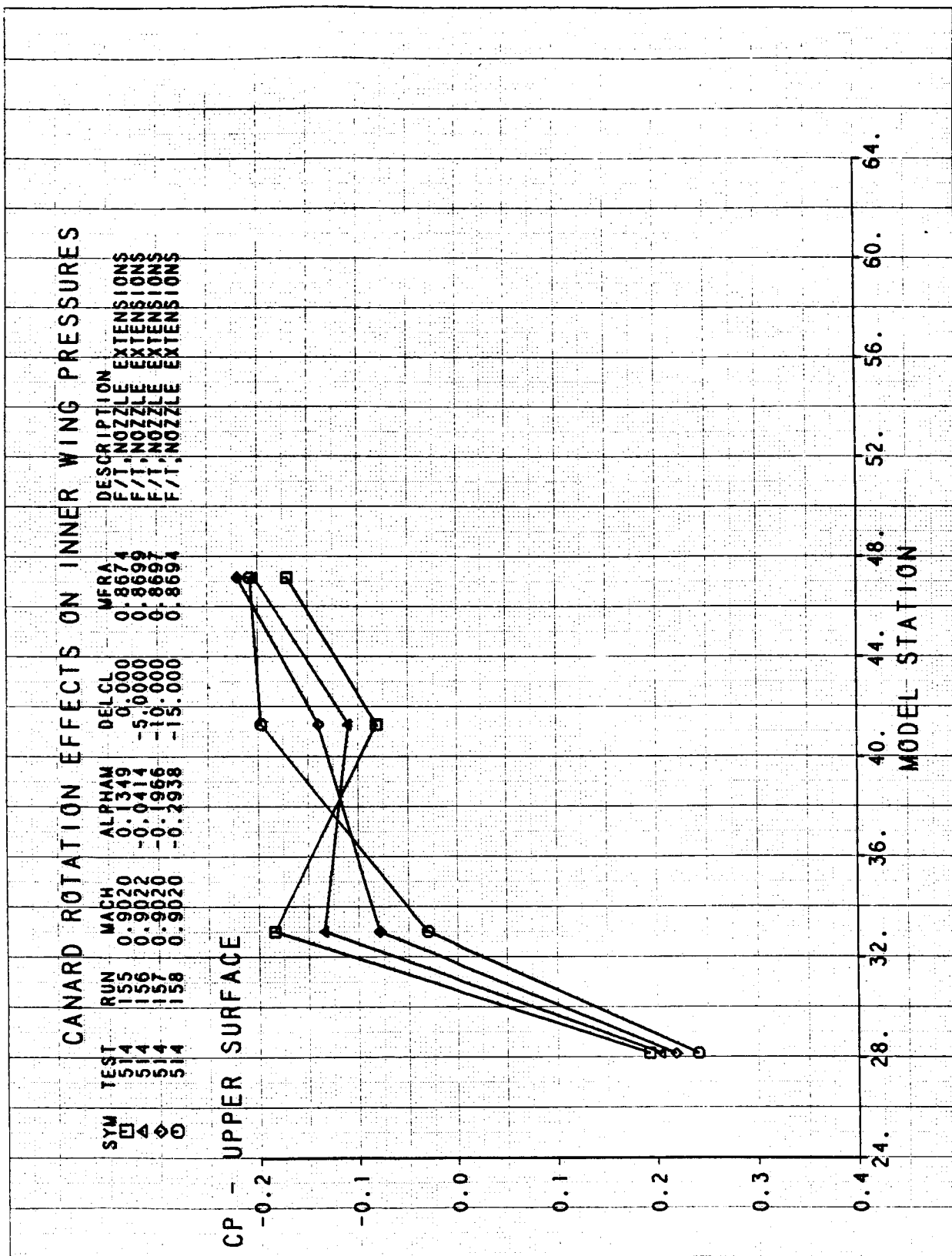


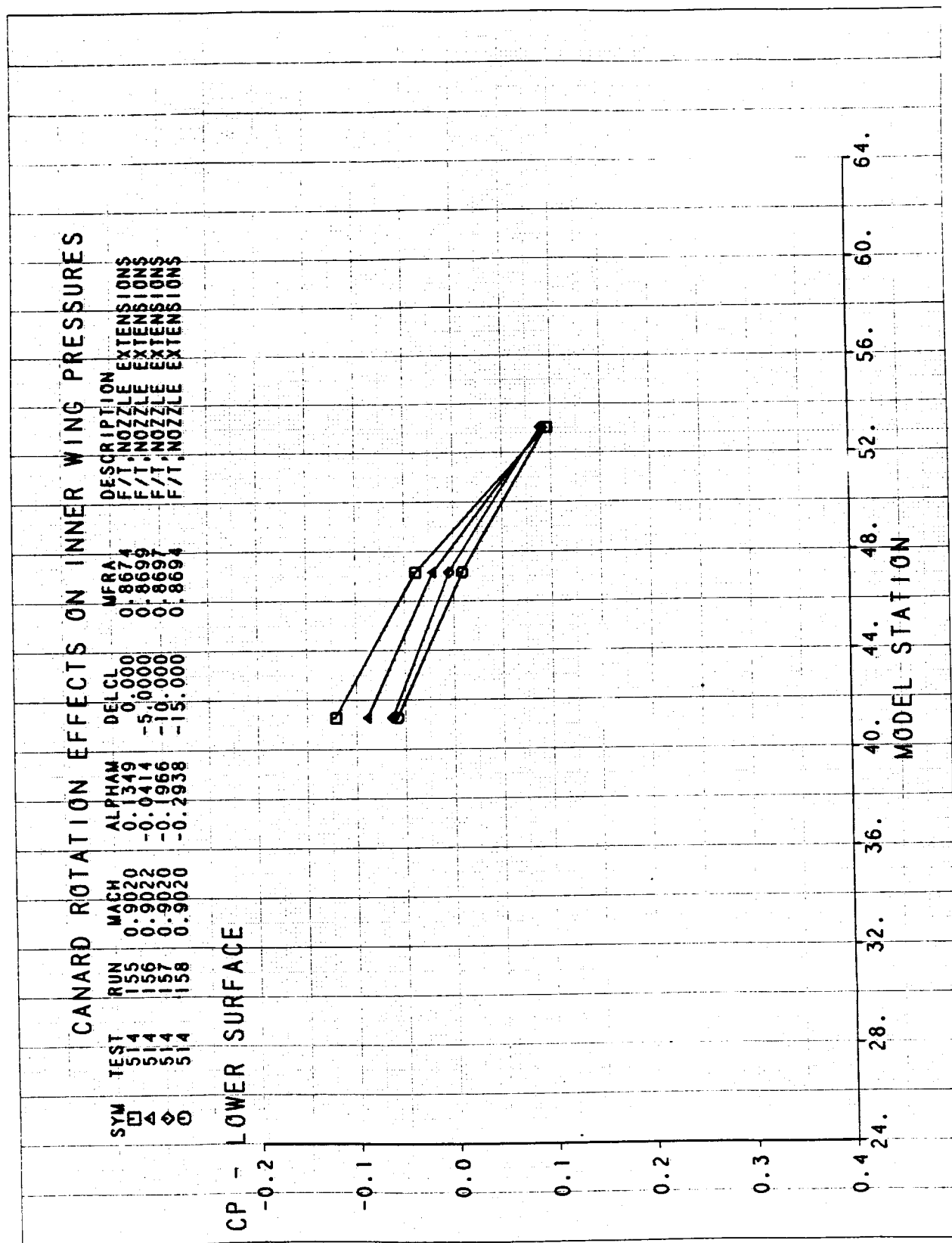


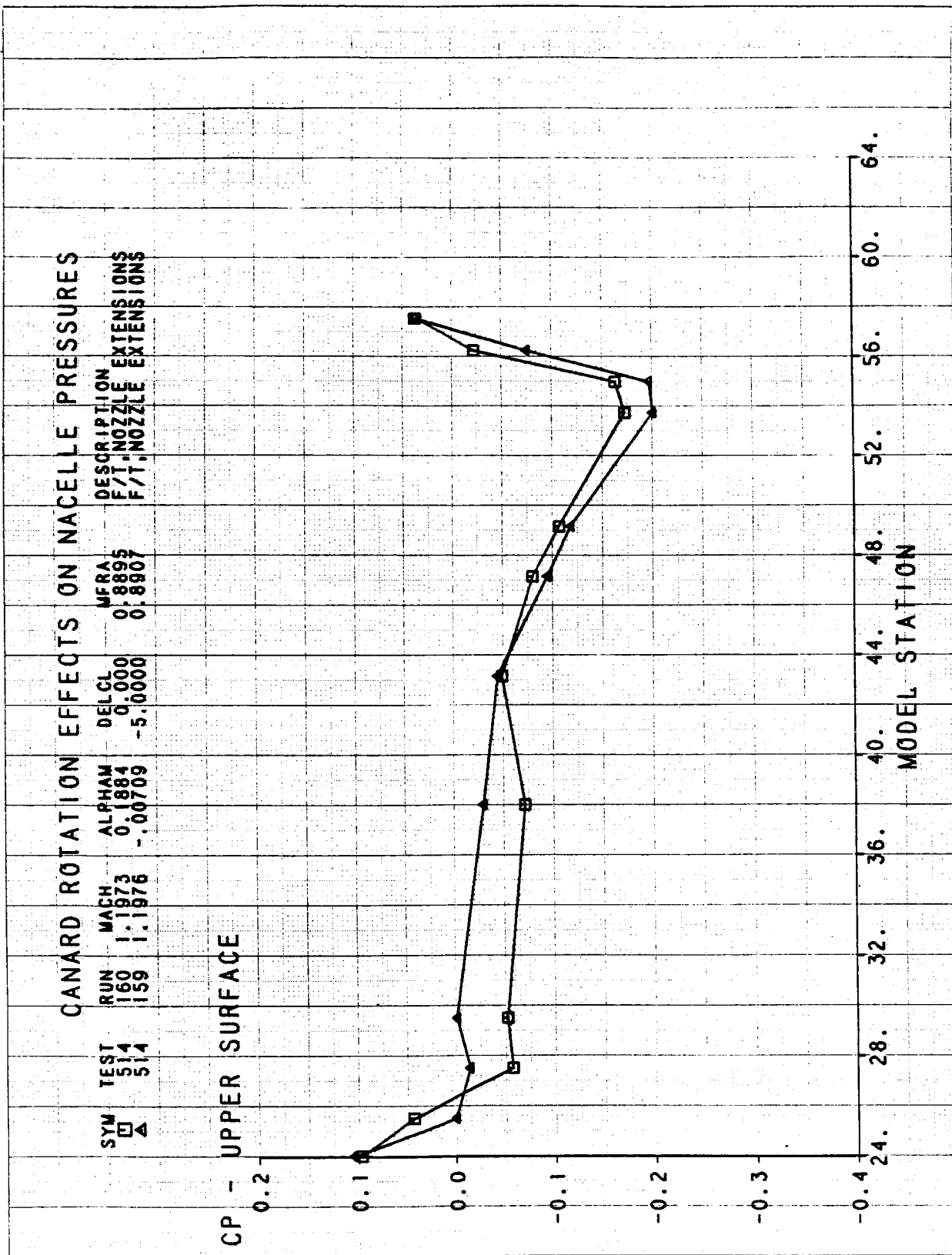


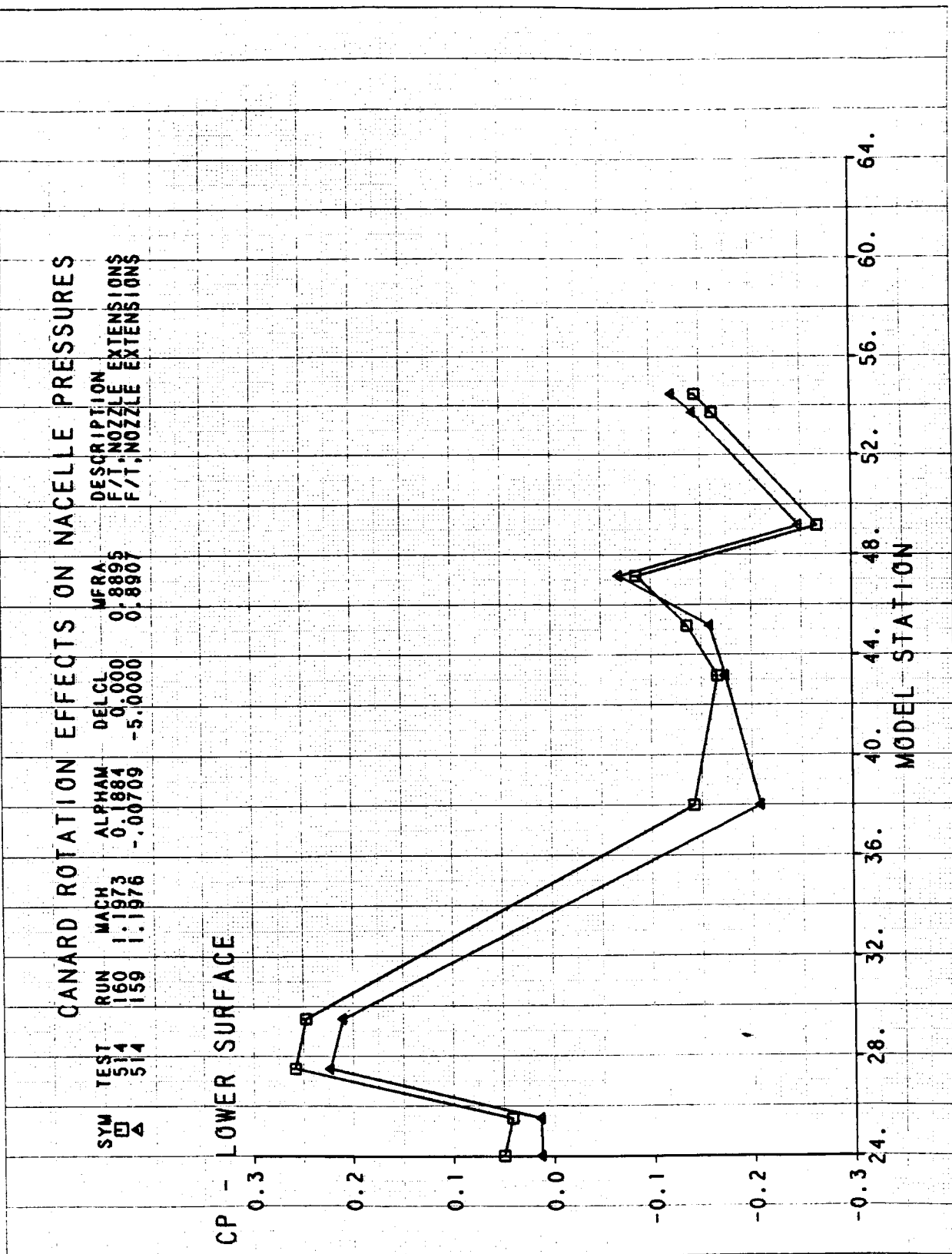


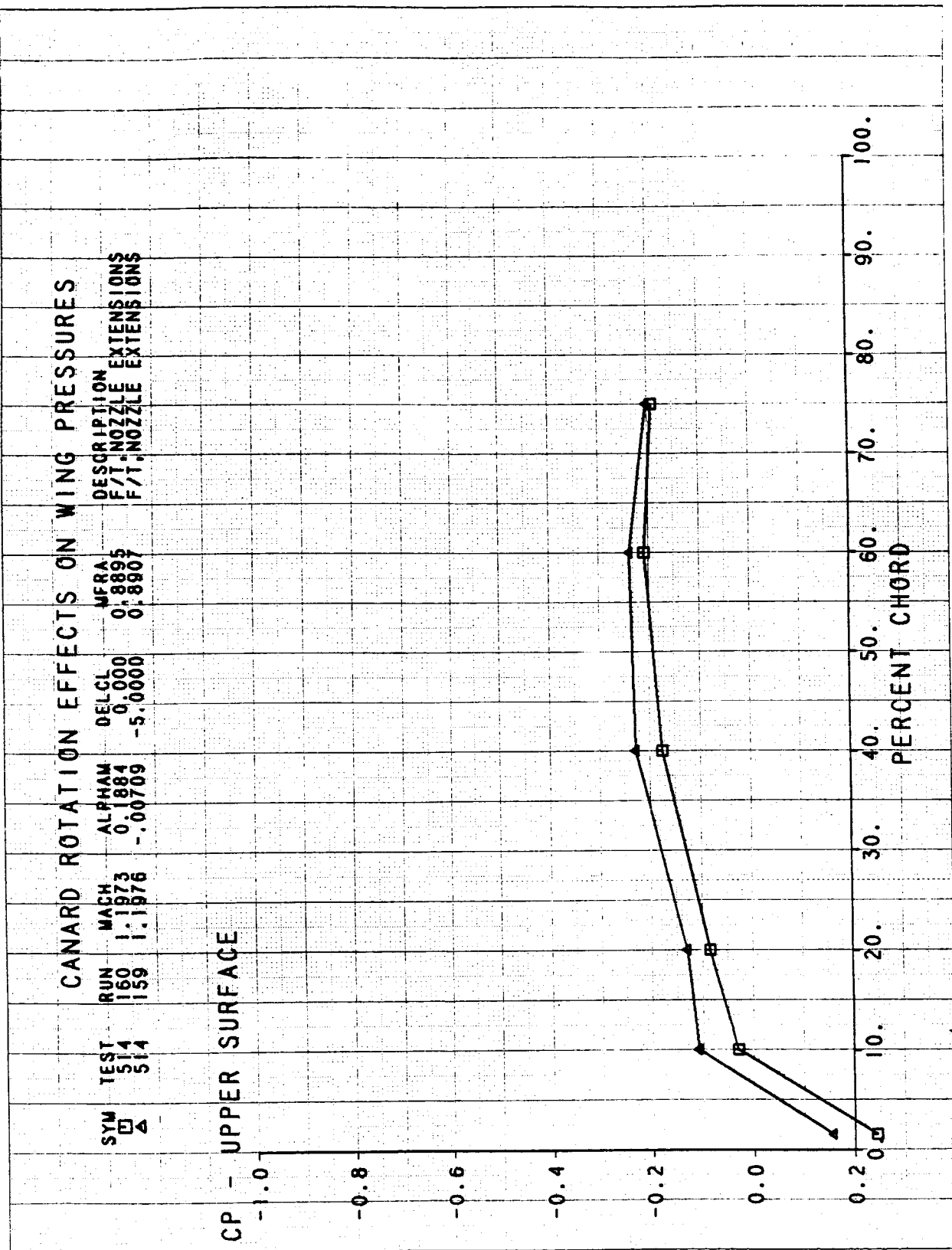
C-5



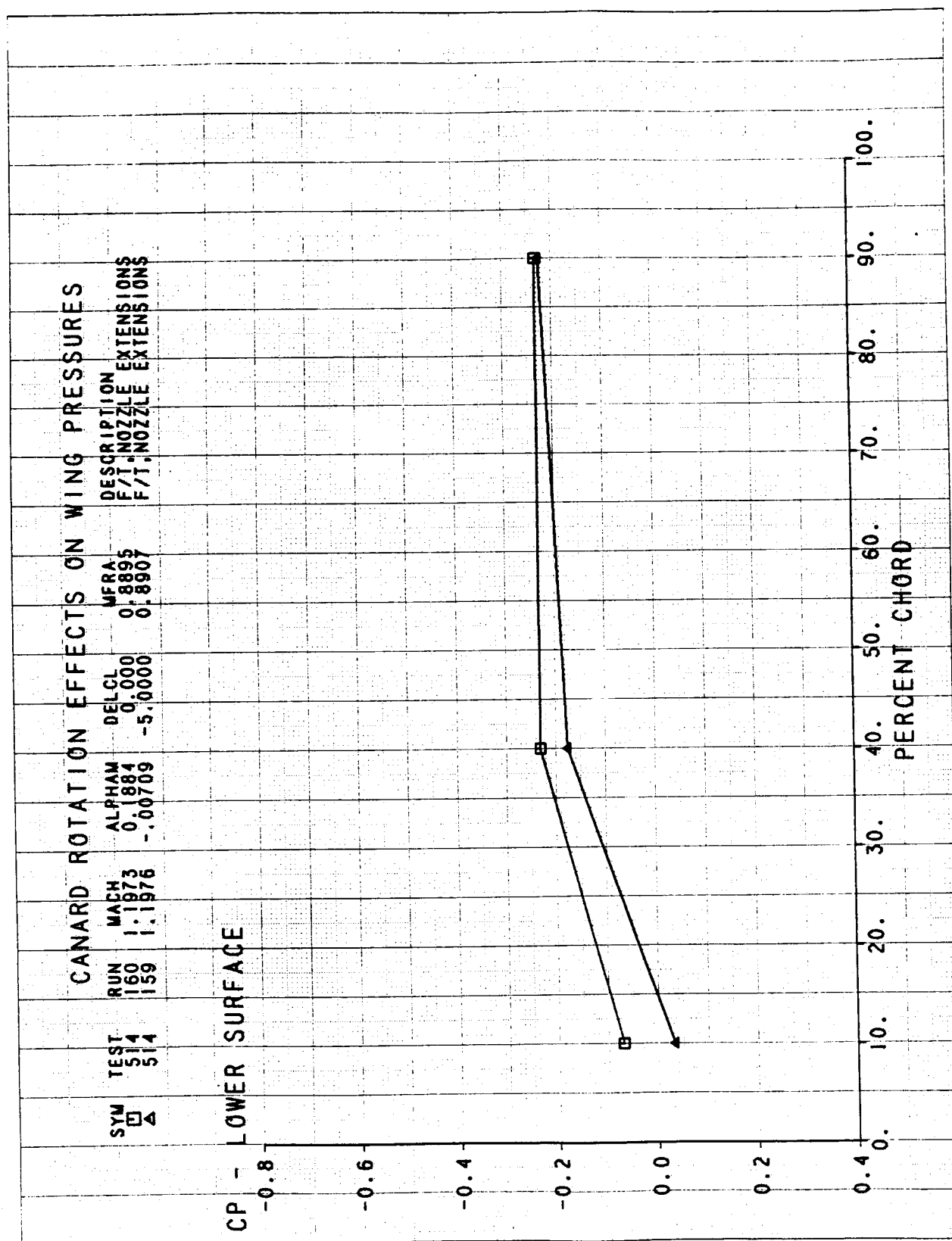


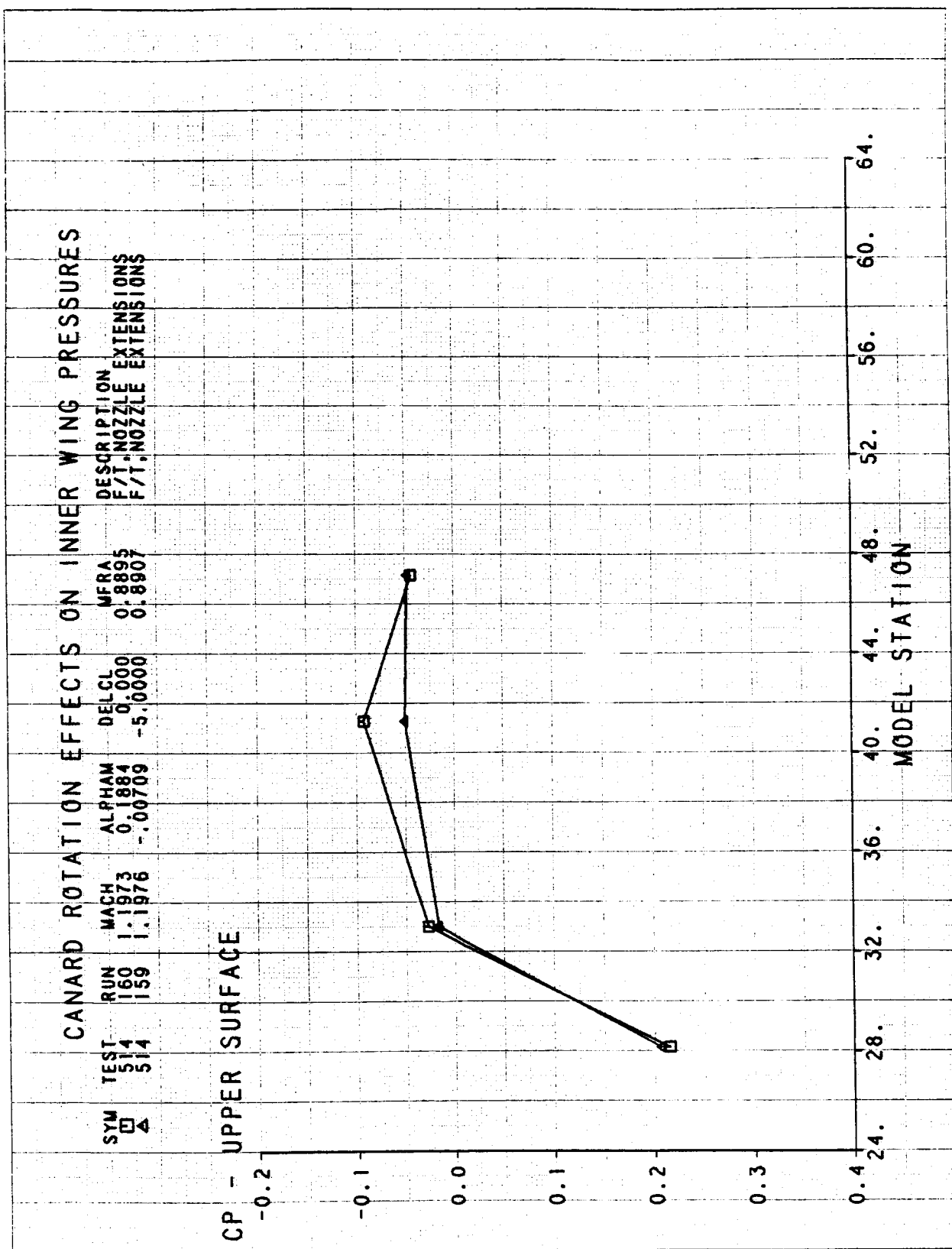


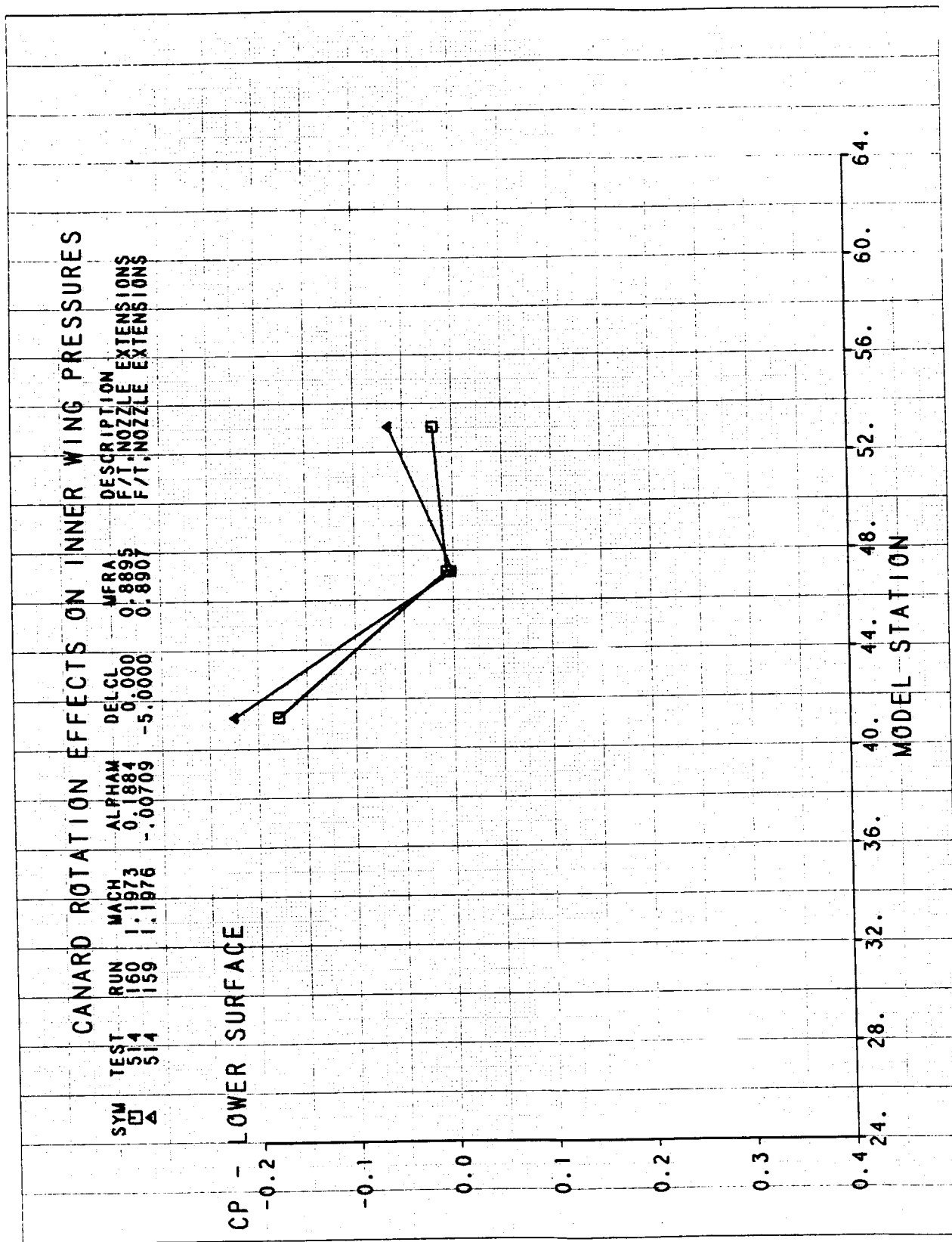


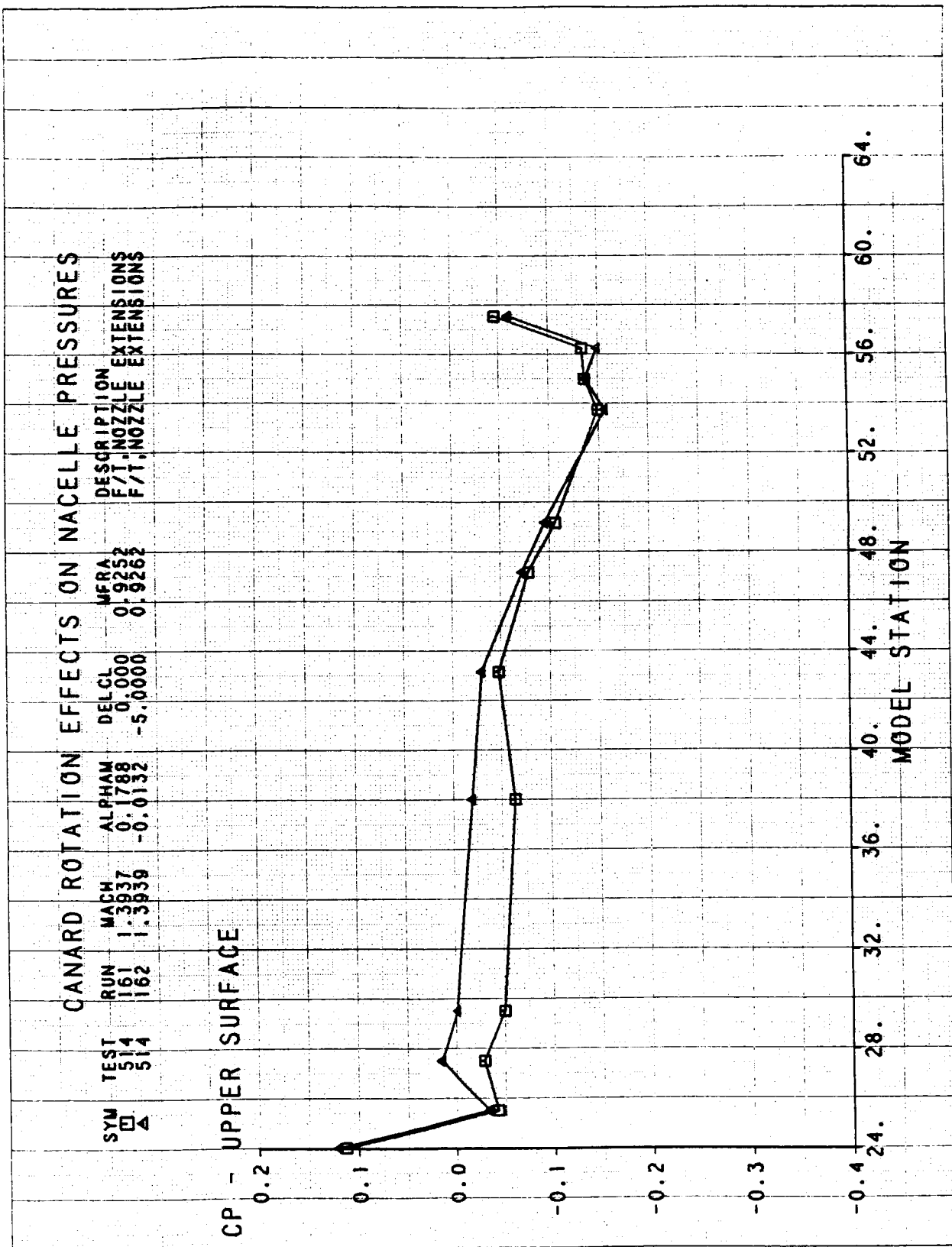


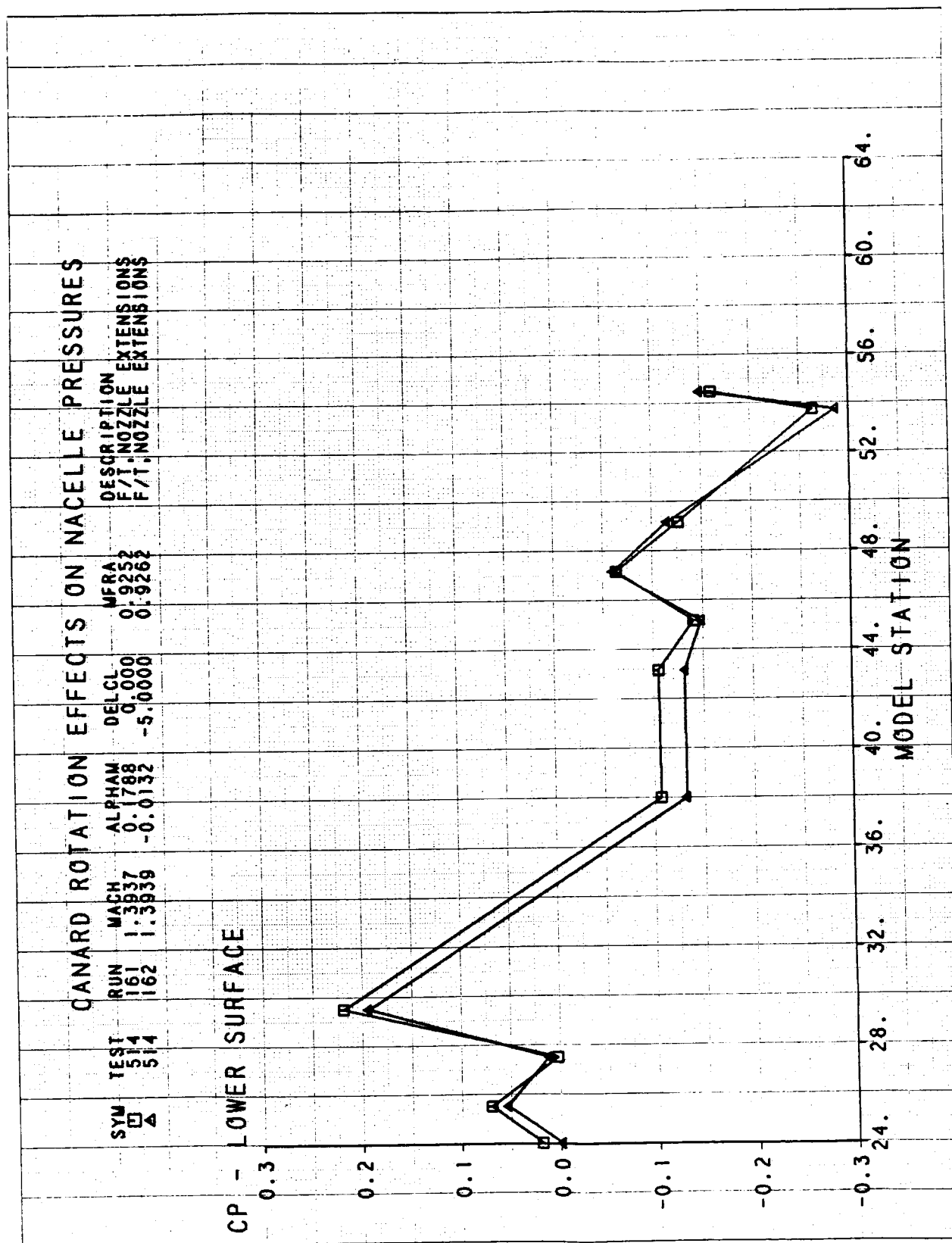


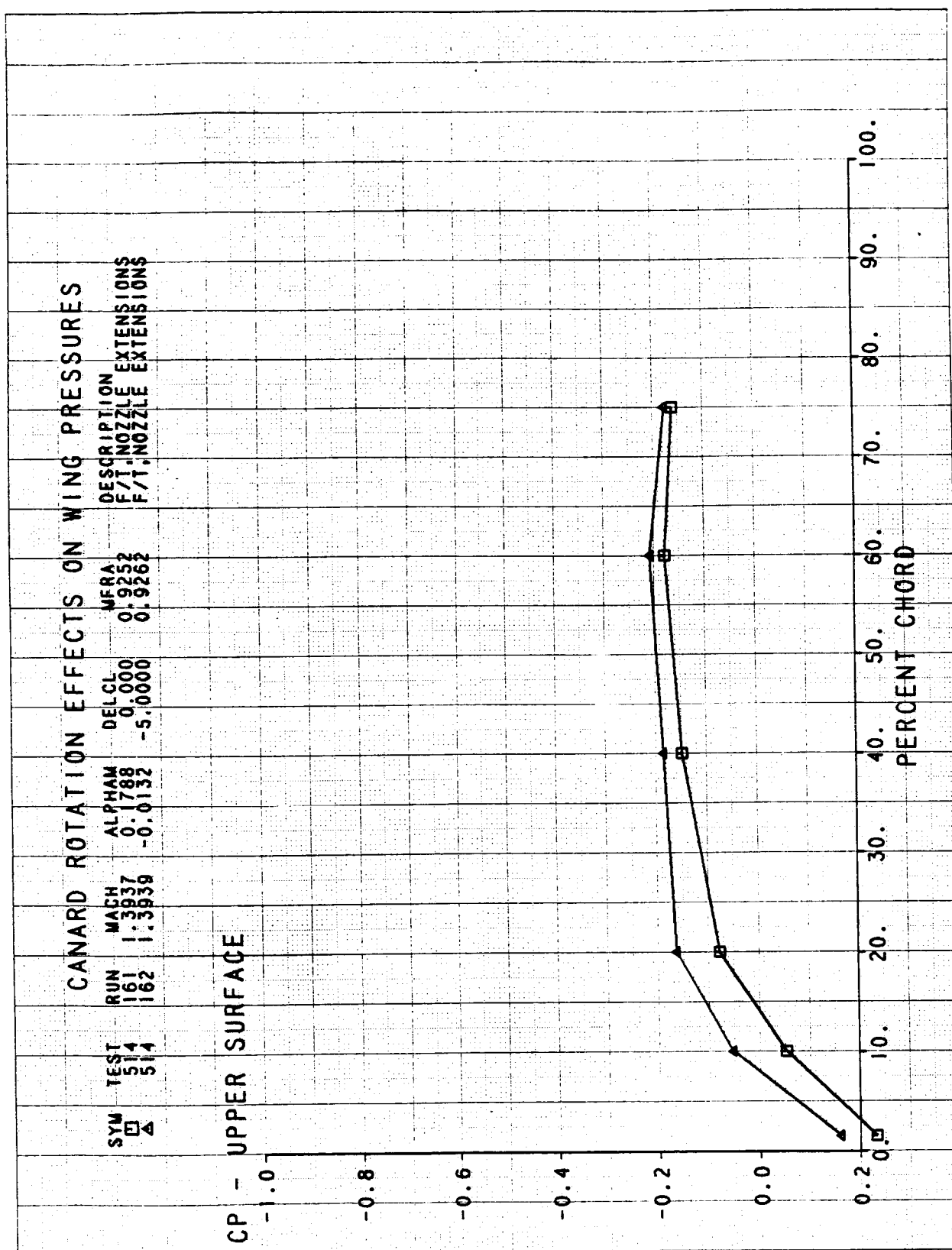


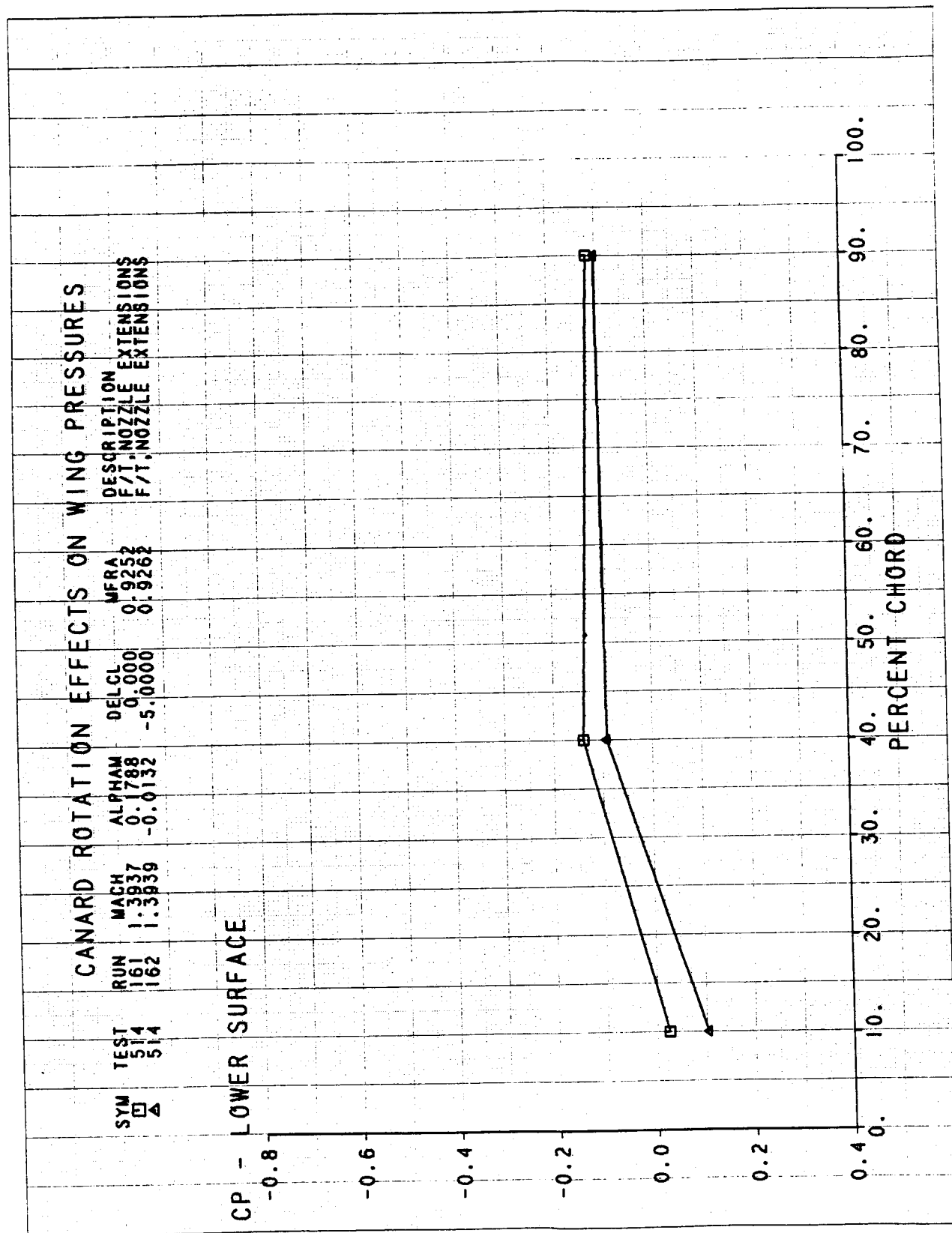








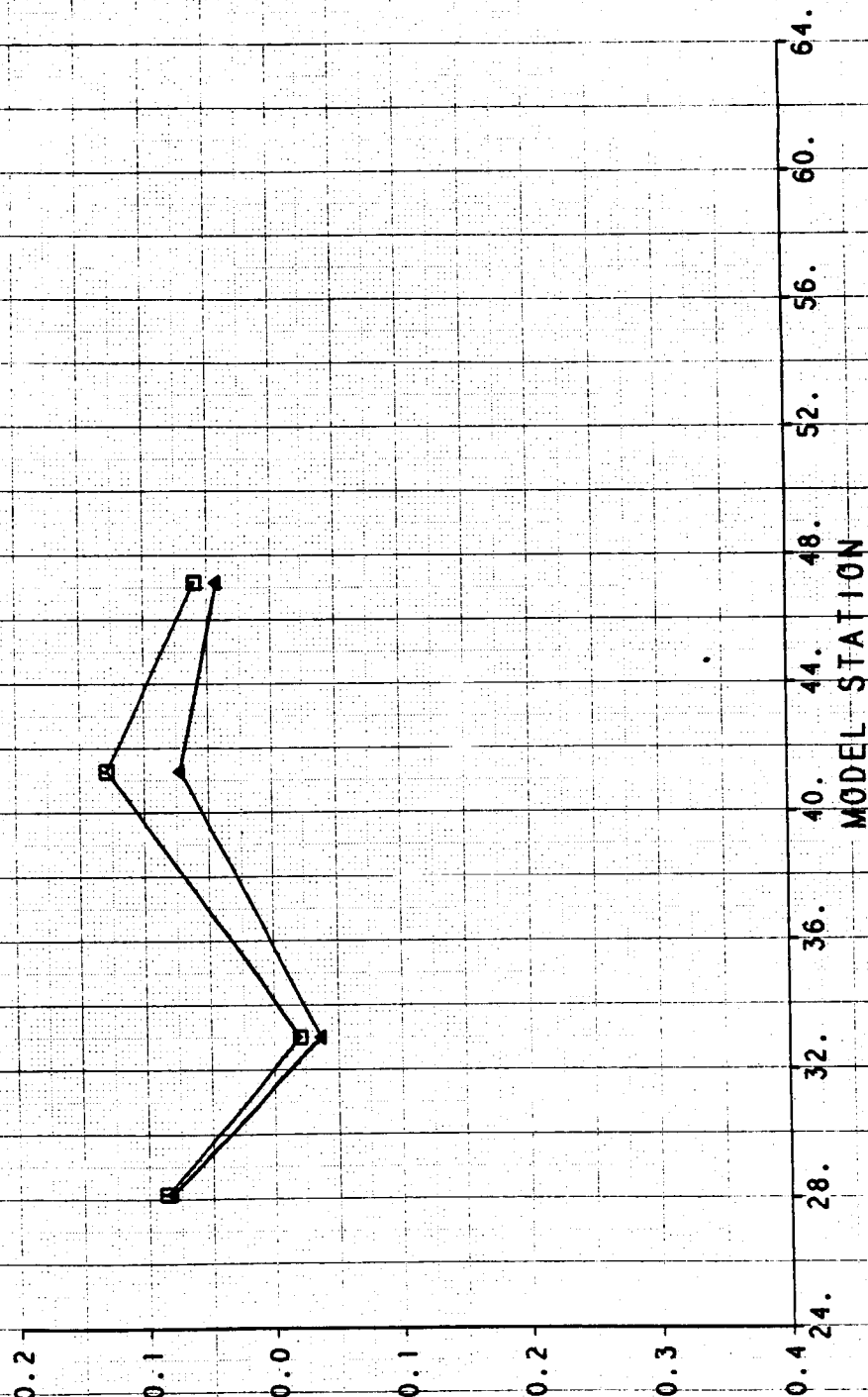




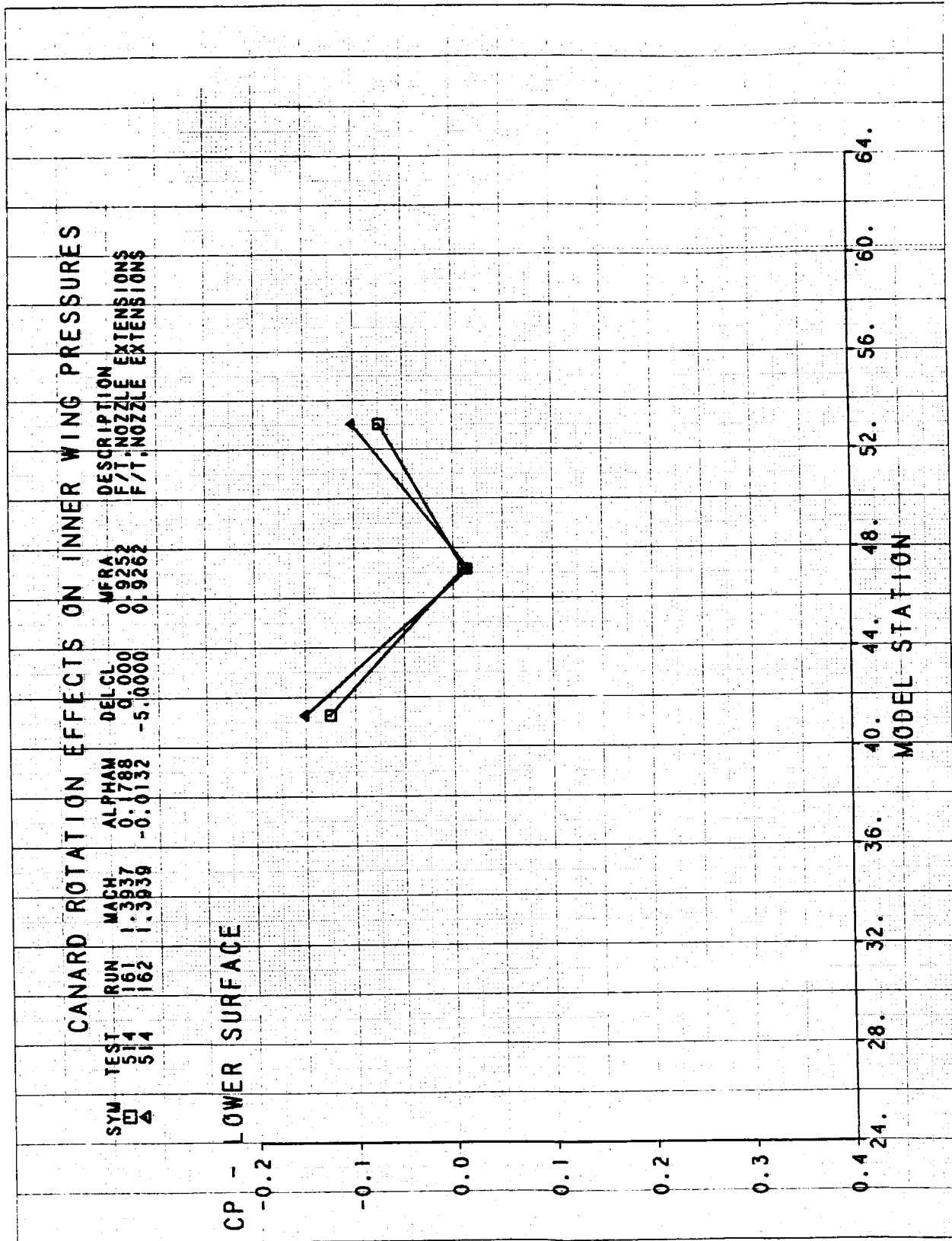
# CANARD ROTATION EFFECTS ON INNER WING PRESSURES

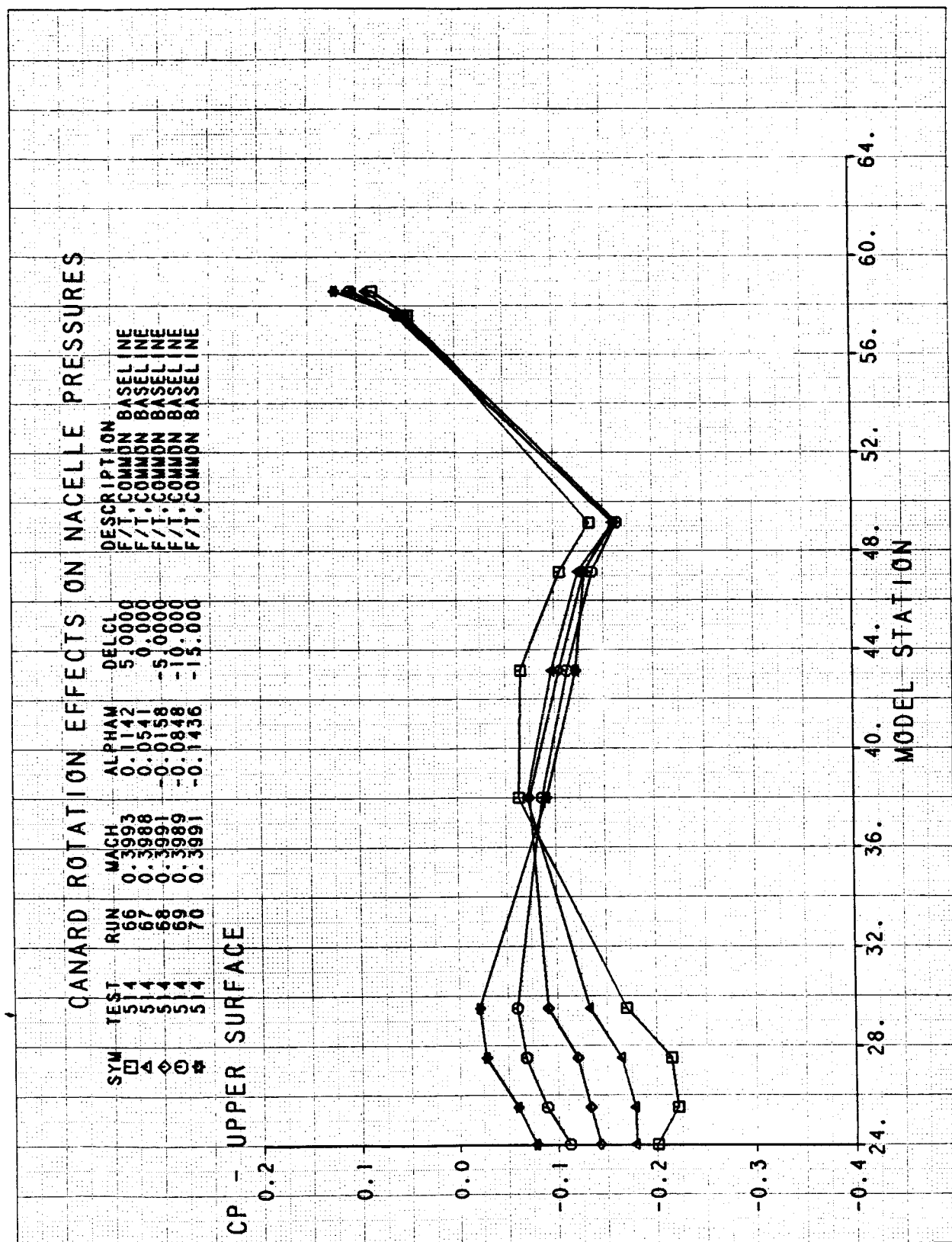
SYM	TEST	RUN	MACH	ALPHAM	DELCL	MERA	DESCRIPTION
□	514	161	1.3937	0.1788	0.000	0.9252	F/T, NOZZLE EXTENSIONS
△	514	162	1.3939	-0.0132	-5.0000	0.9262	F/T, NOZZLE EXTENSIONS

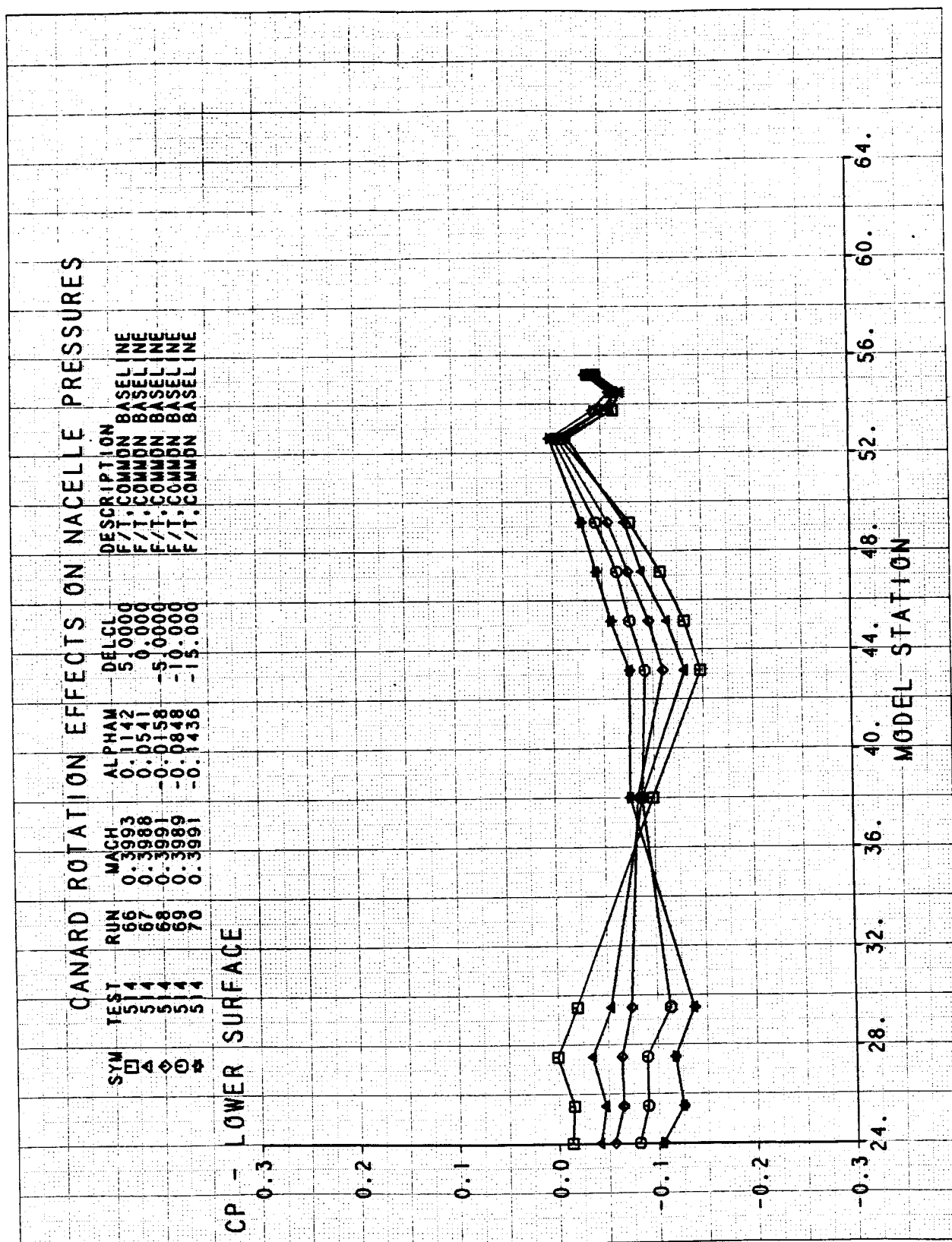
CP - UPPER SURFACE

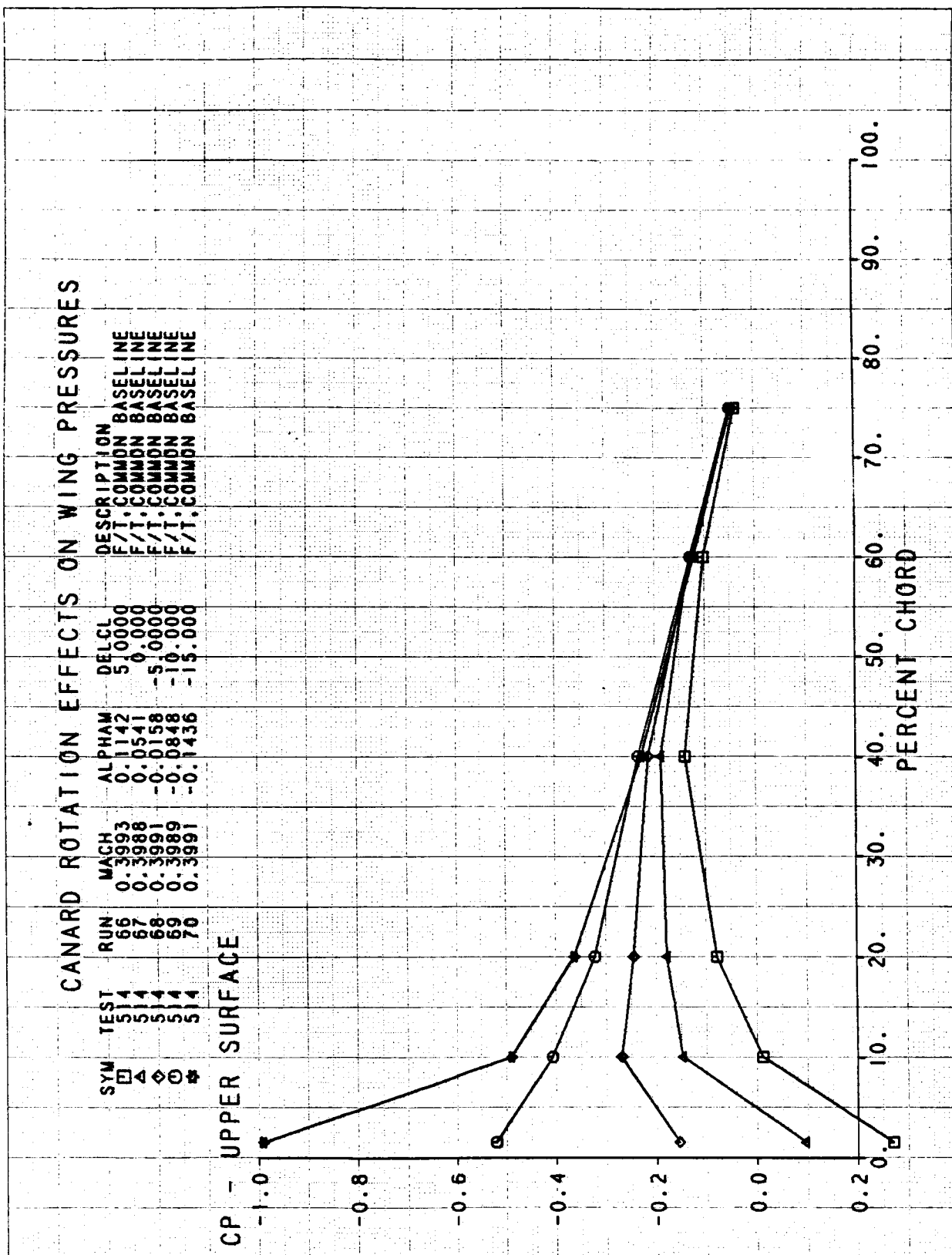


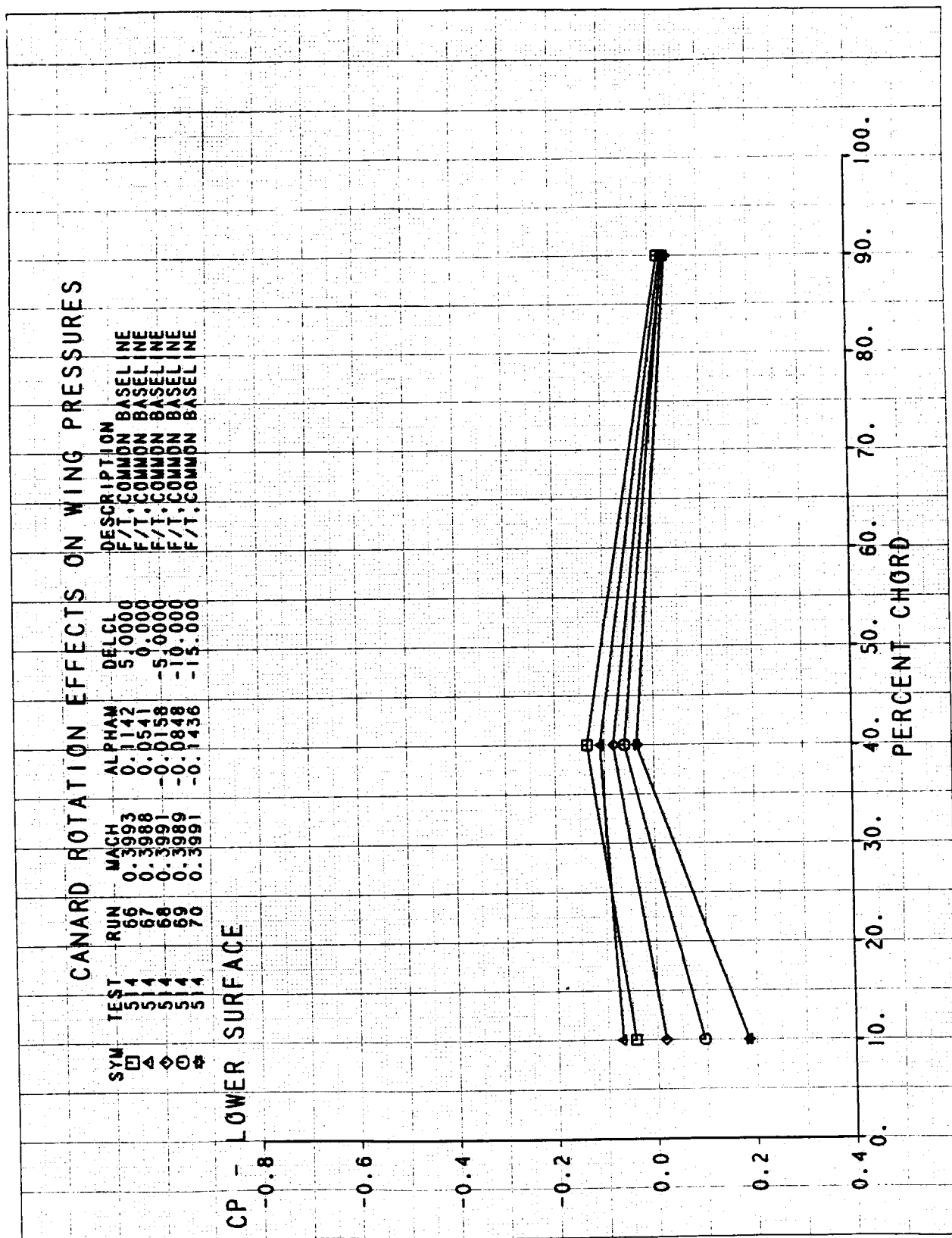


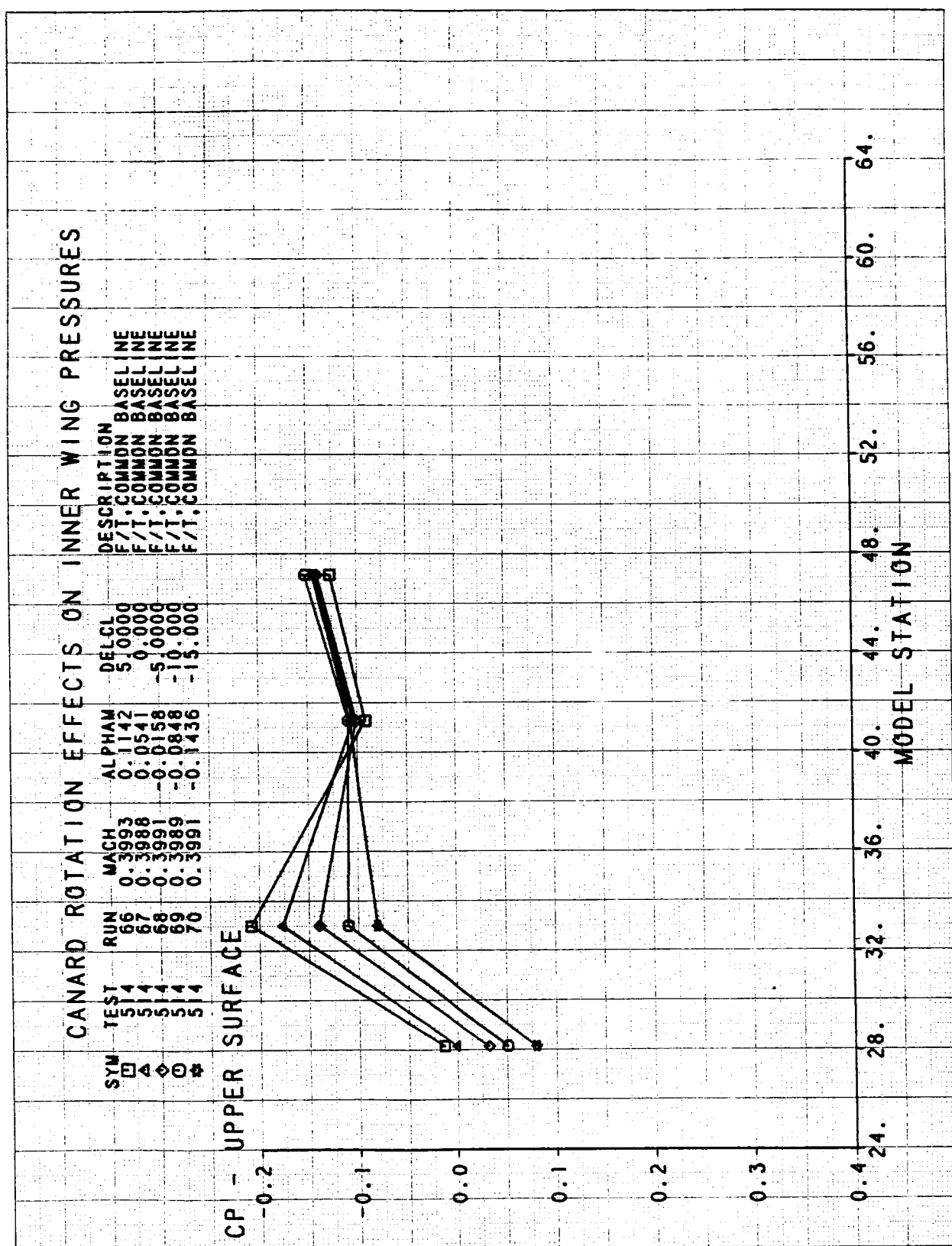


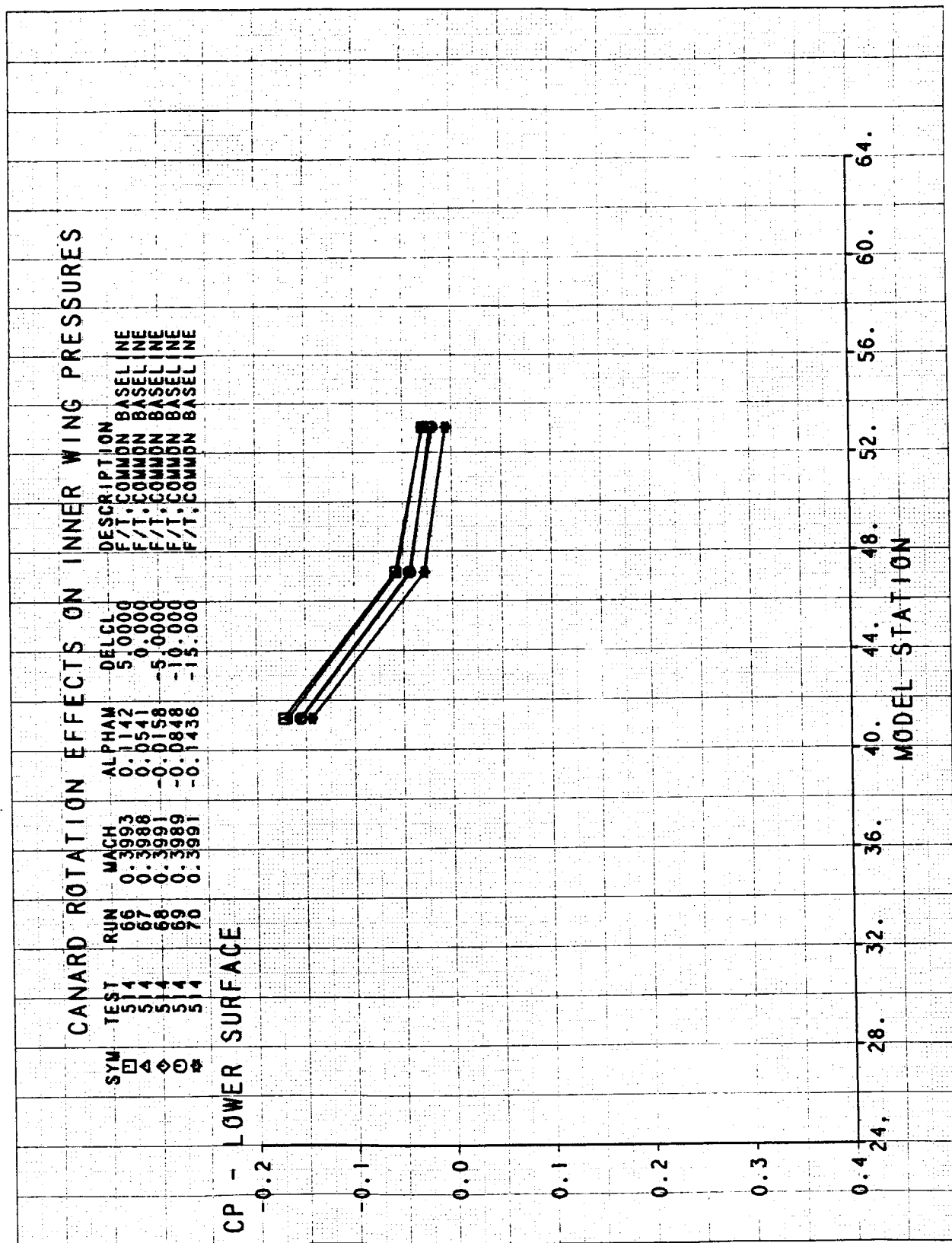


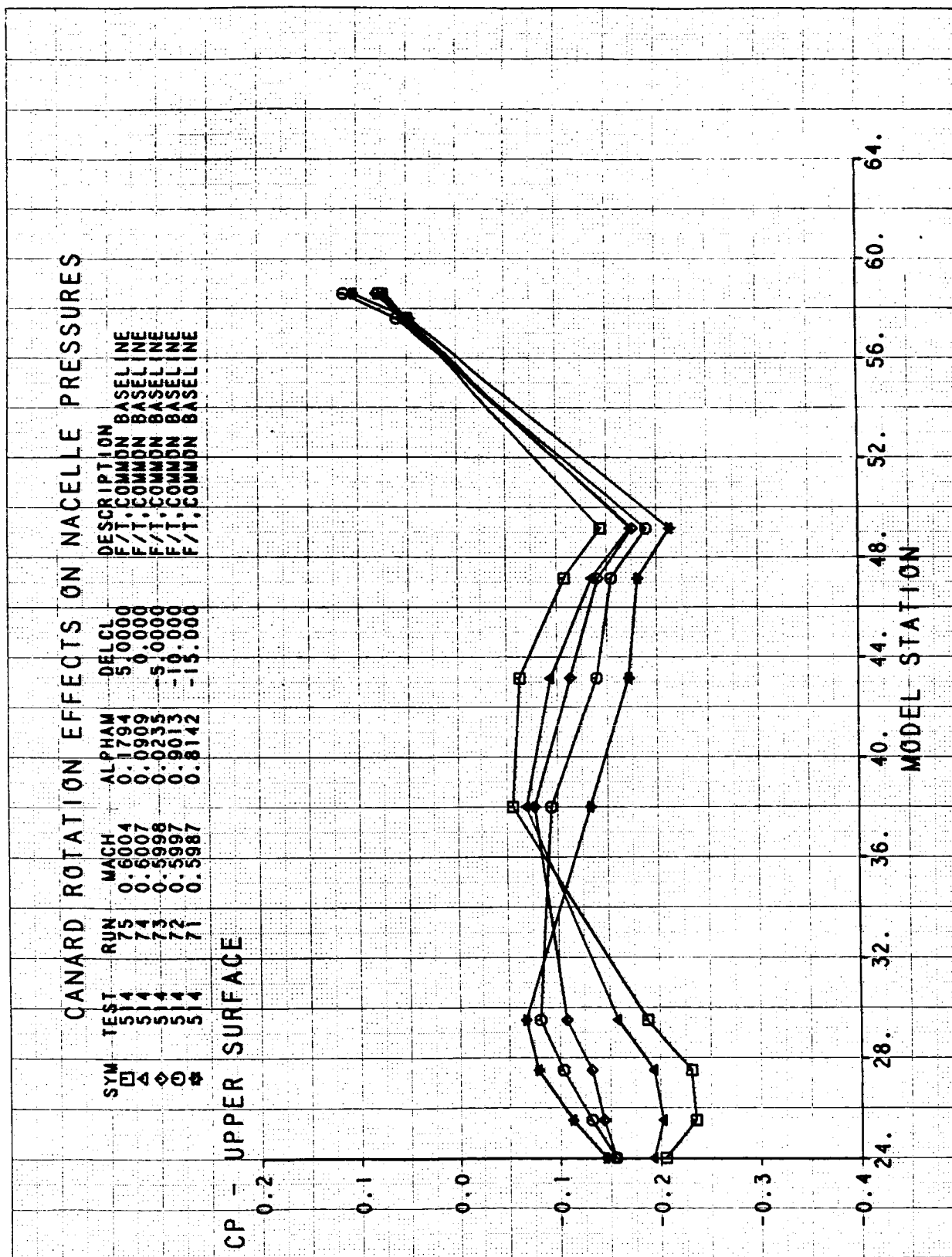




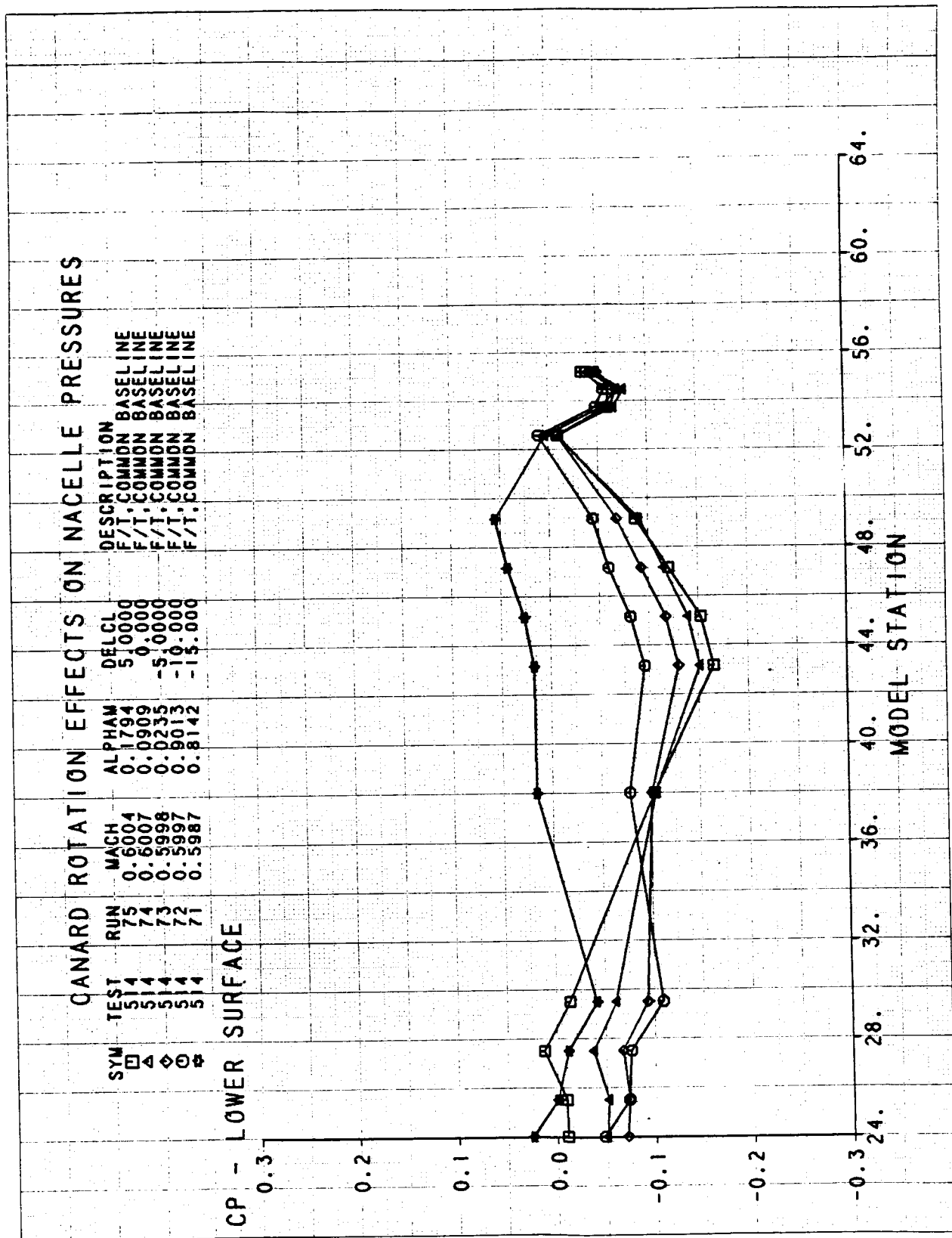






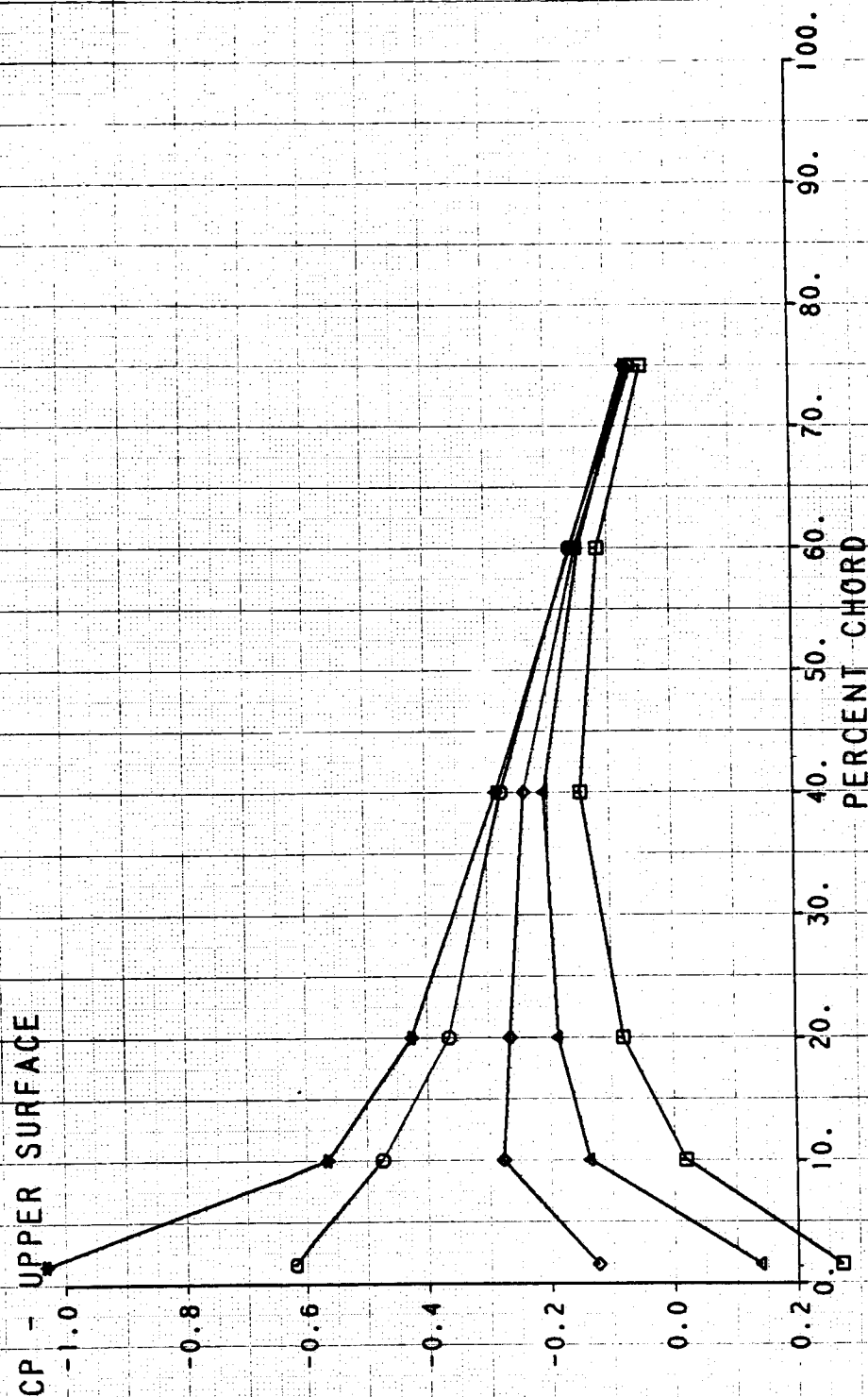


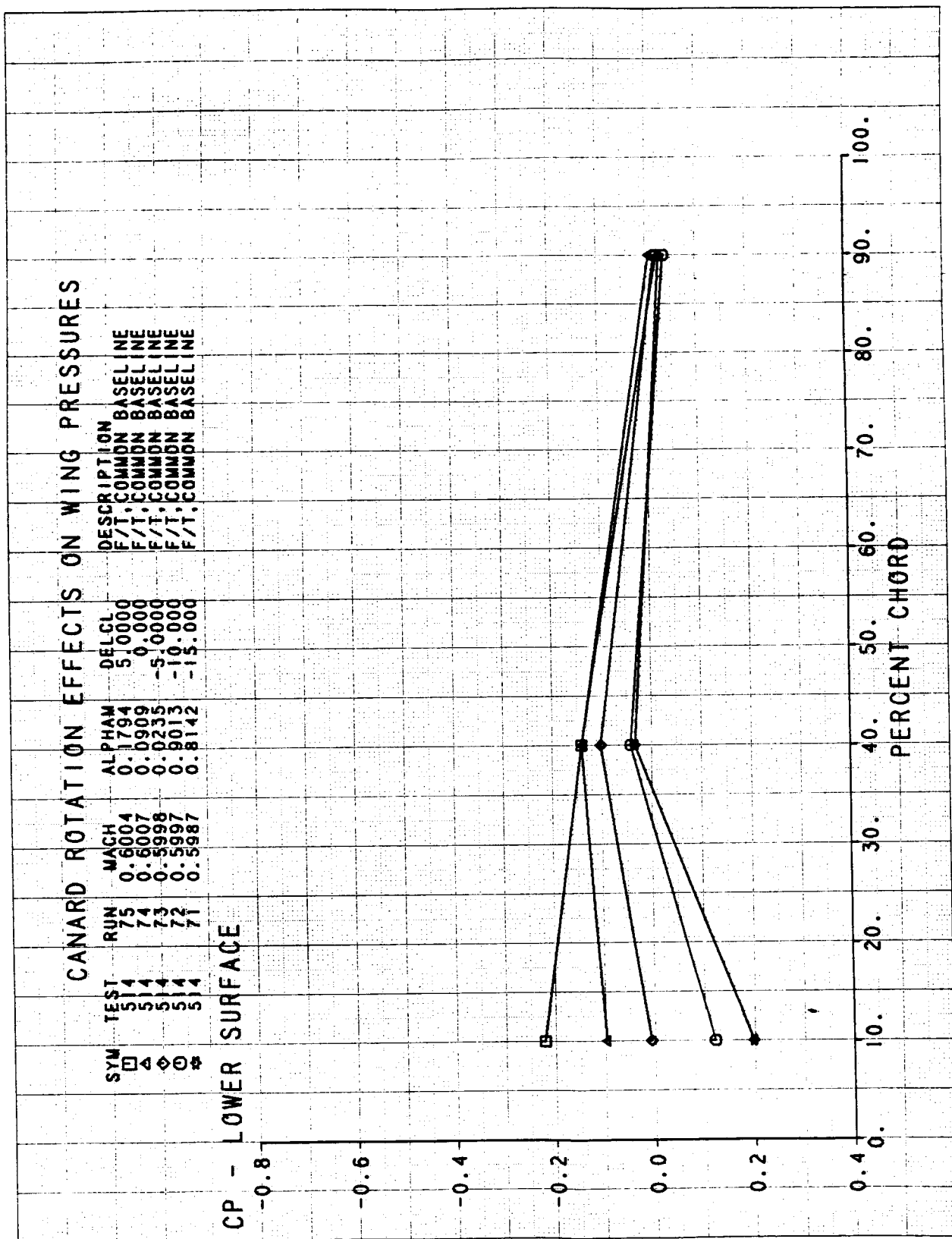


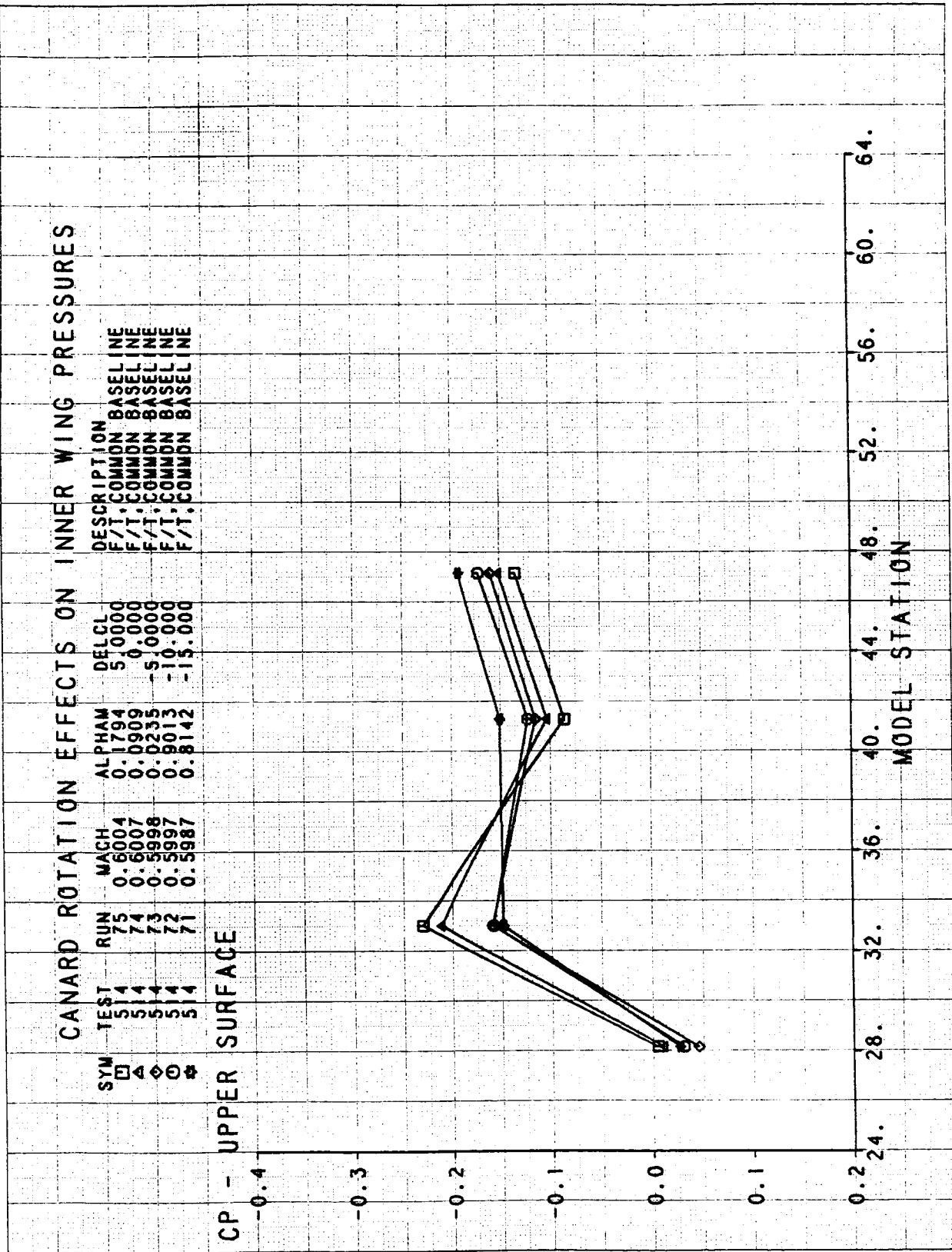


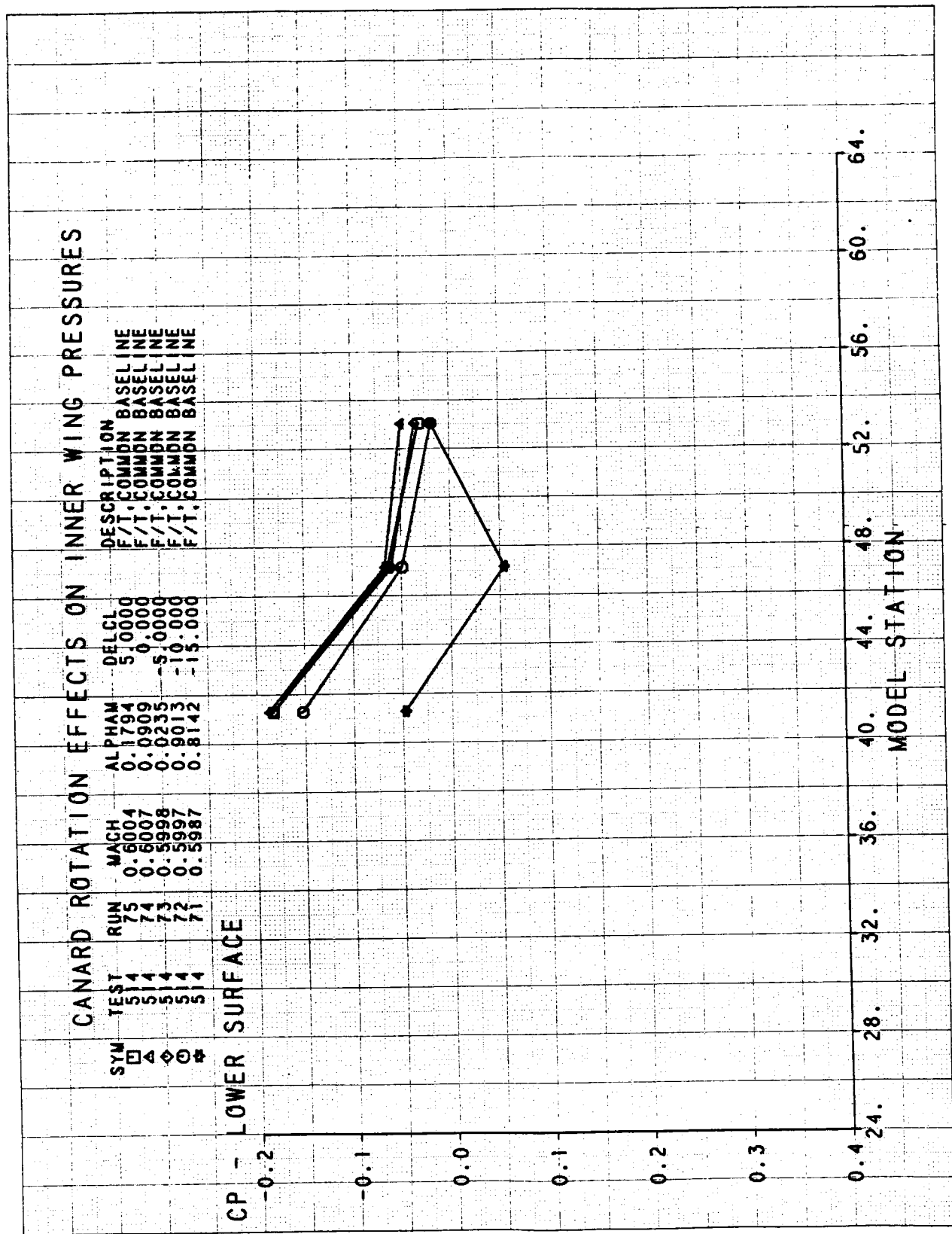
# CANARD ROTATION EFFECTS ON WING PRESSURES

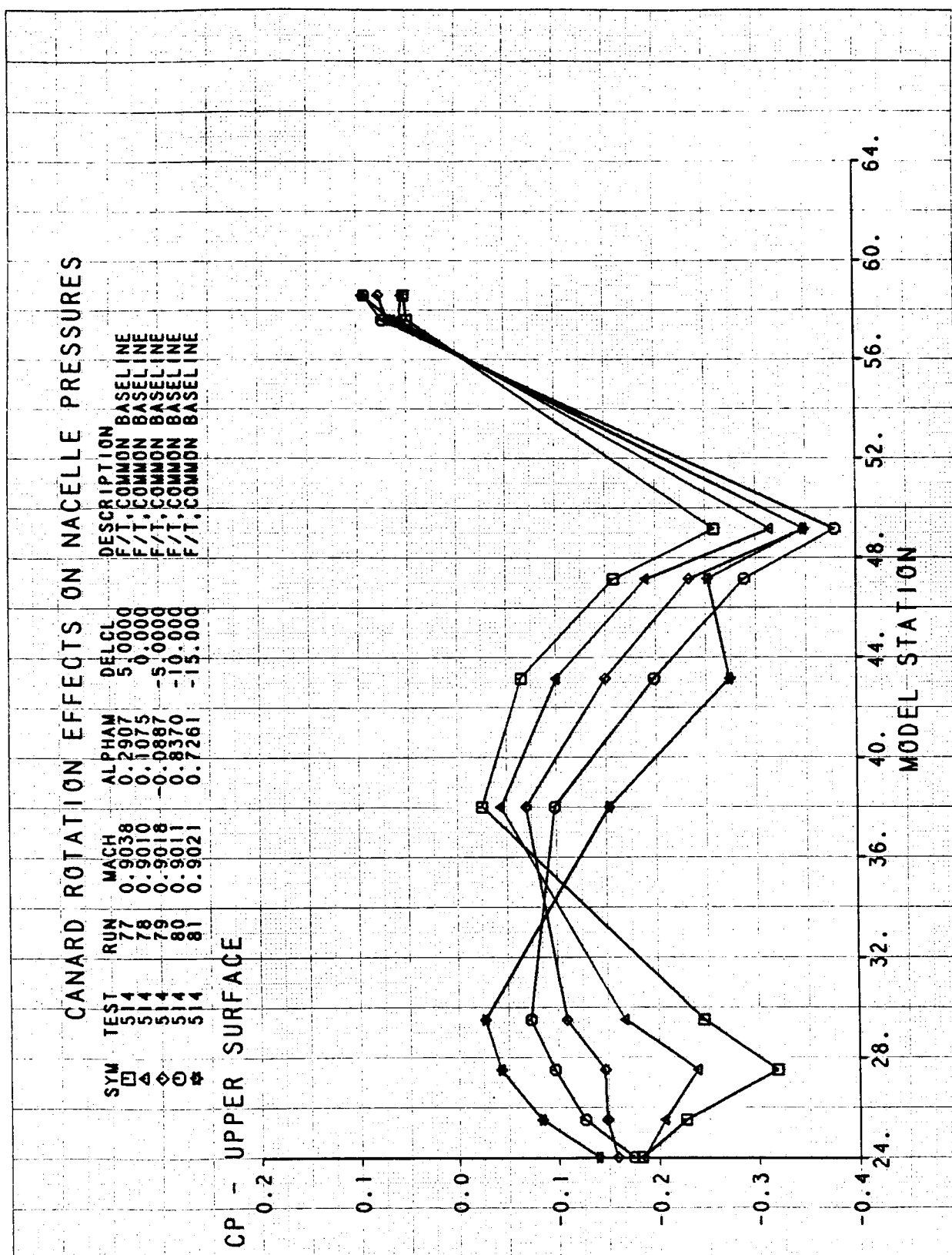
SYM	TEST	RUN	MACH	ALPHAM	DELCL	DESCRIPTION
□	514	75	0.6004	0.1794	5.0000	F/T, COMMON BASELINE
△	514	74	0.6007	0.0909	0.0000	F/T, COMMON BASELINE
◇	514	73	0.5998	0.0235	-5.0000	F/T, COMMON BASELINE
○	514	72	0.5997	0.9013	-10.0000	F/T, COMMON BASELINE
⊗	514	71	0.5987	0.8142	-15.0000	F/T, COMMON BASELINE

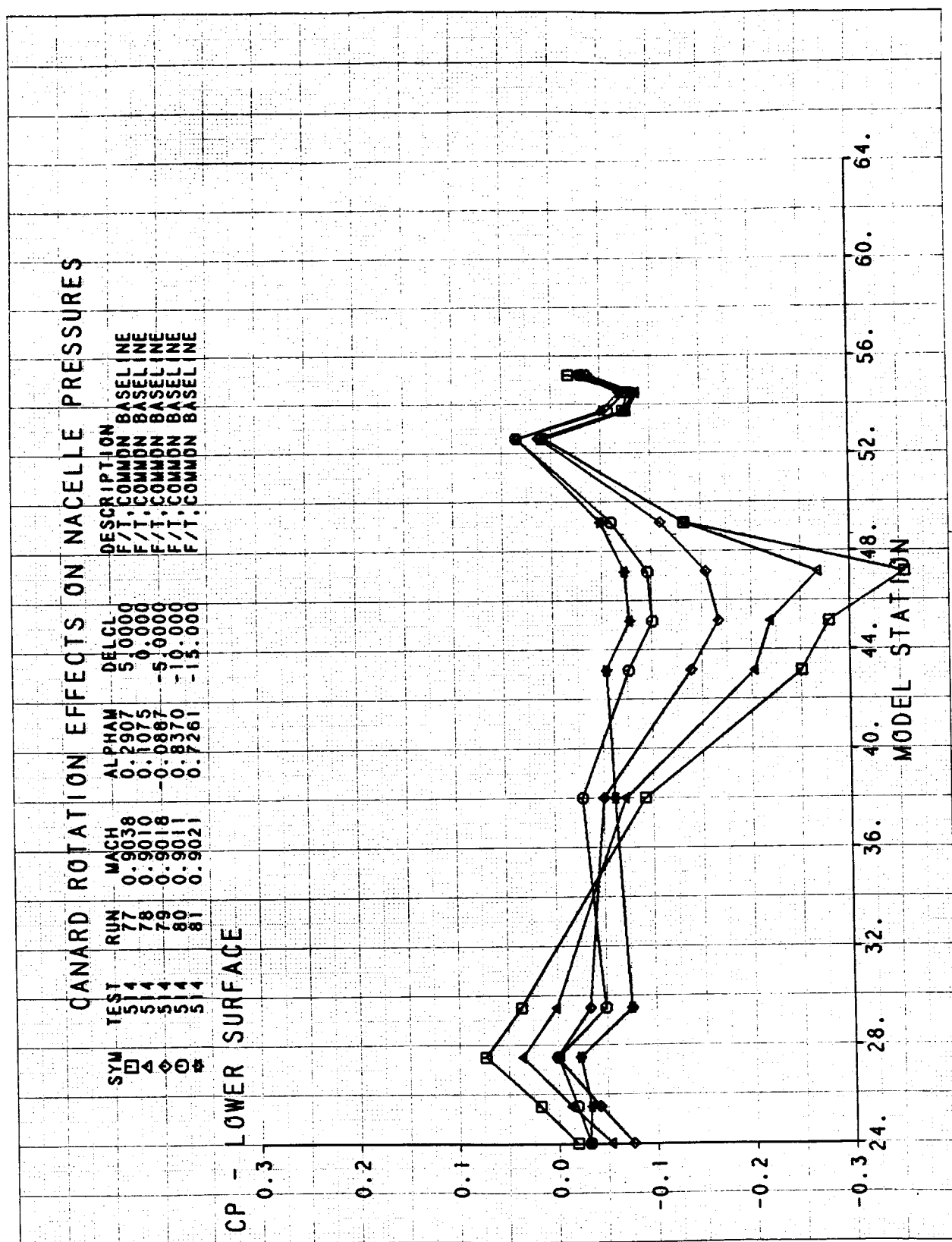








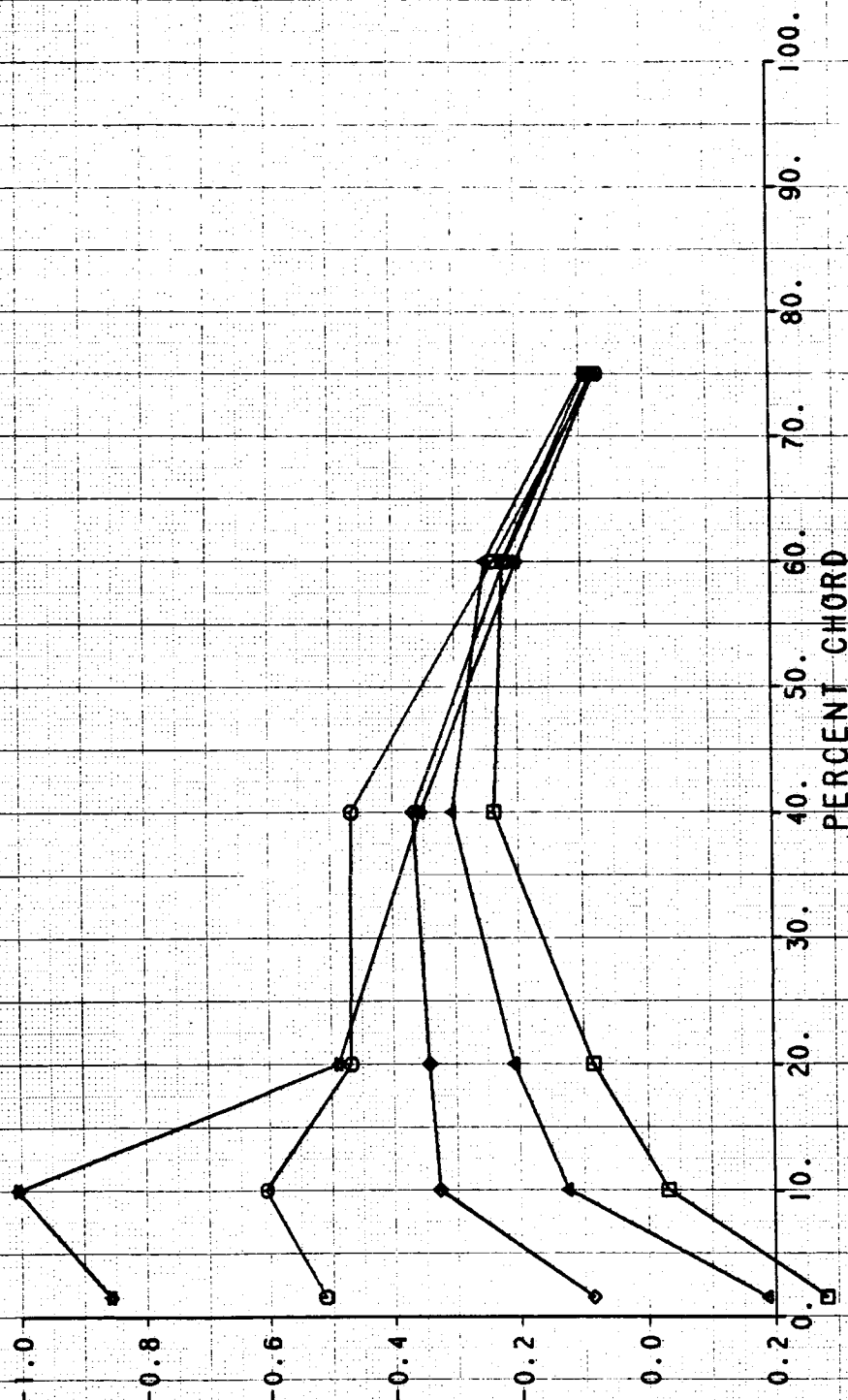




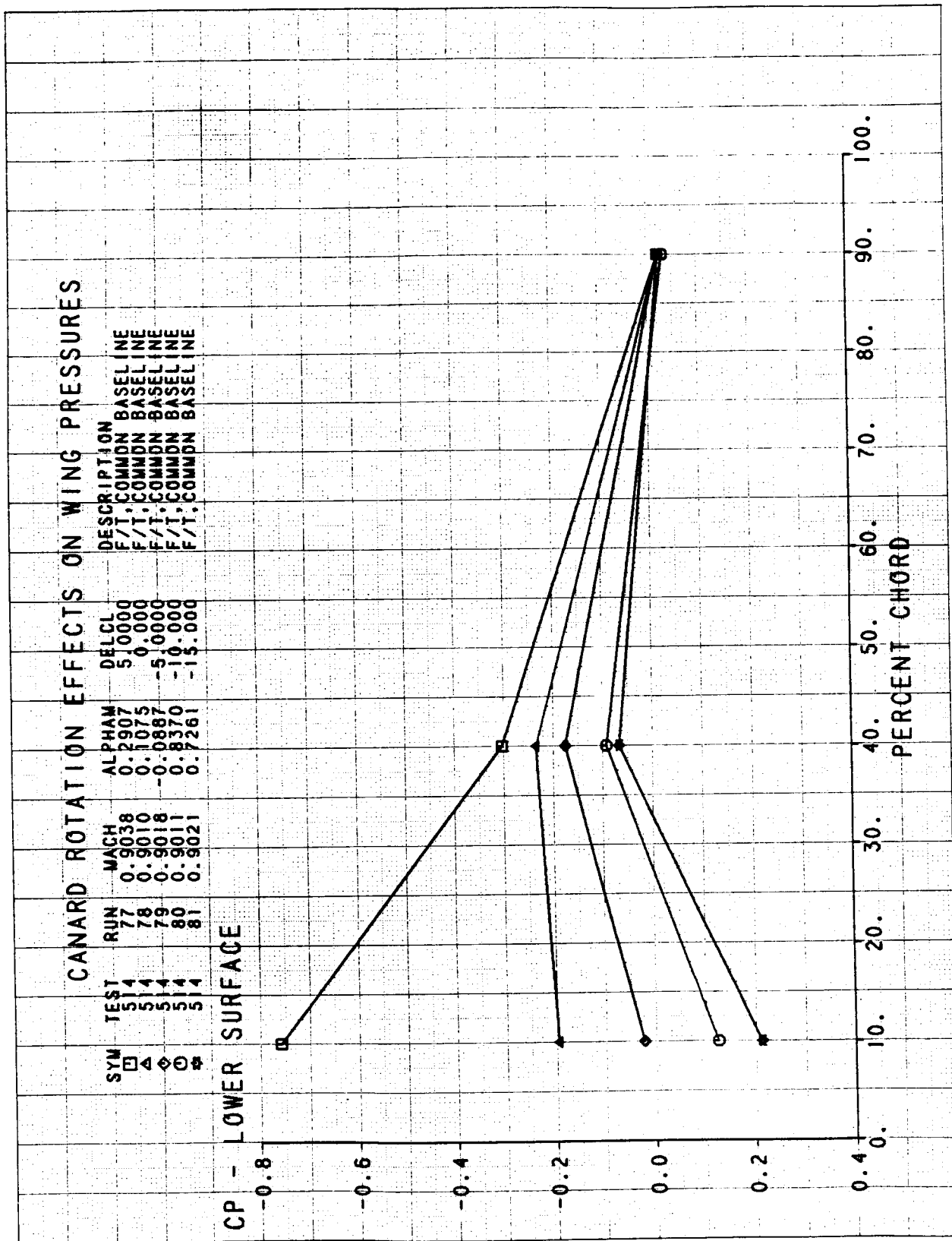
# CANARD ROTATION EFFECTS ON WING PRESSURES

SYM	TEST	RUN	MACH	ALPHAM	DELCL	DESCRIPTION
□	514	77	0.9038	0.2907	5.0000	F/T, COMMON BASELINE
△	514	78	0.9010	0.1075	0.000	F/T, COMMON BASELINE
◇	514	79	0.9018	-0.0887	-5.0000	F/T, COMMON BASELINE
○	514	80	0.9011	0.8370	-10.000	F/T, COMMON BASELINE
⊗	514	81	0.9021	0.7261	-15.000	F/T, COMMON BASELINE

CP - UPPER SURFACE



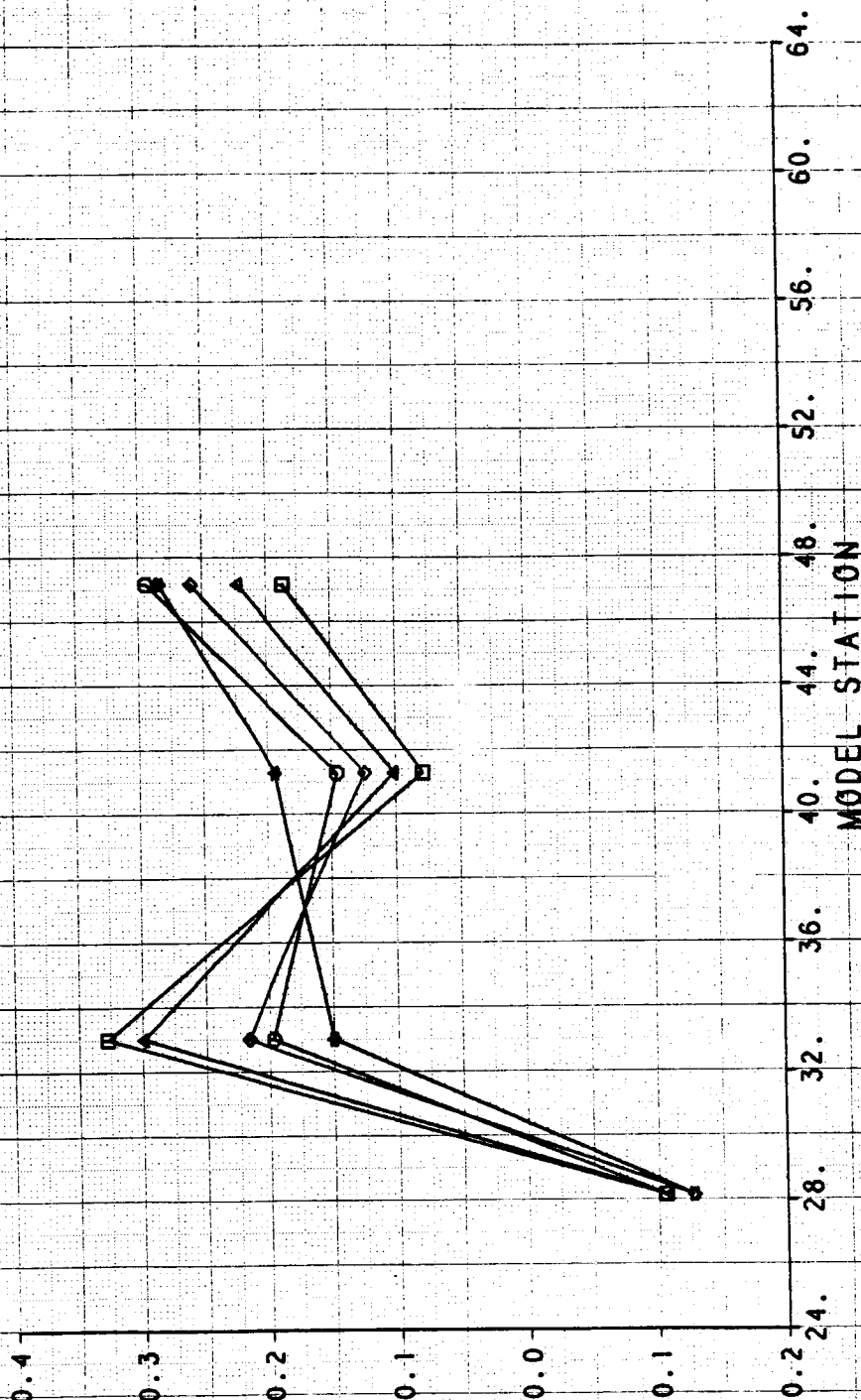




# CANARD ROTATION EFFECTS ON INNER WING PRESSURES

SYM	TEST	RUN	MACH	ALPHAM	DELCL	DESCRIPTION
□	514	77	0.9038	0.2907	5.0000	F/T, COMMON BASELINE
△	514	78	0.9010	0.1075	0.0000	F/T, COMMON BASELINE
◇	514	79	0.9018	-0.0887	-5.0000	F/T, COMMON BASELINE
○	514	80	0.9011	0.8370	-10.0000	F/T, COMMON BASELINE
⊗	514	81	0.9021	0.7261	-15.0000	F/T, COMMON BASELINE

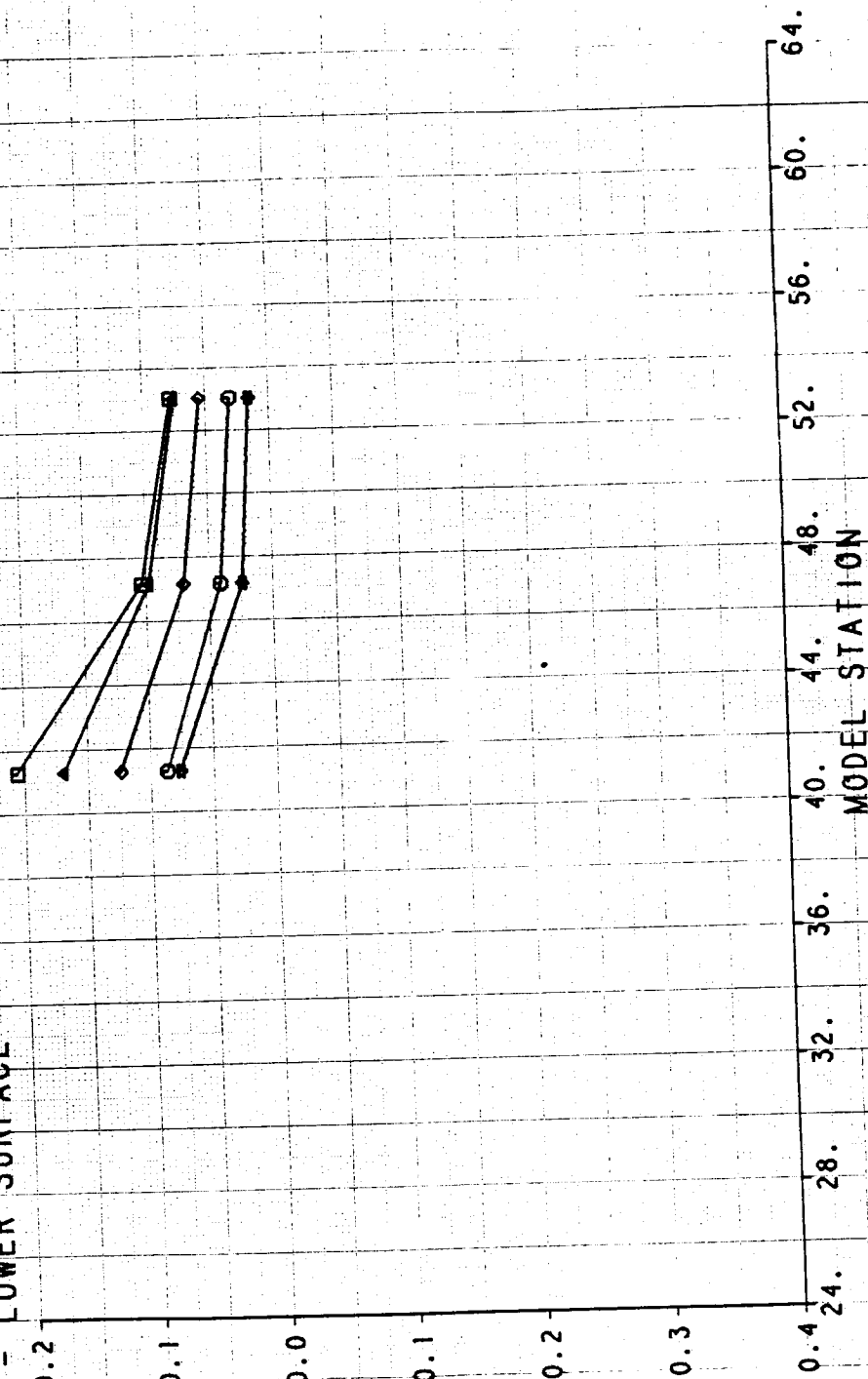
CP - UPPER SURFACE

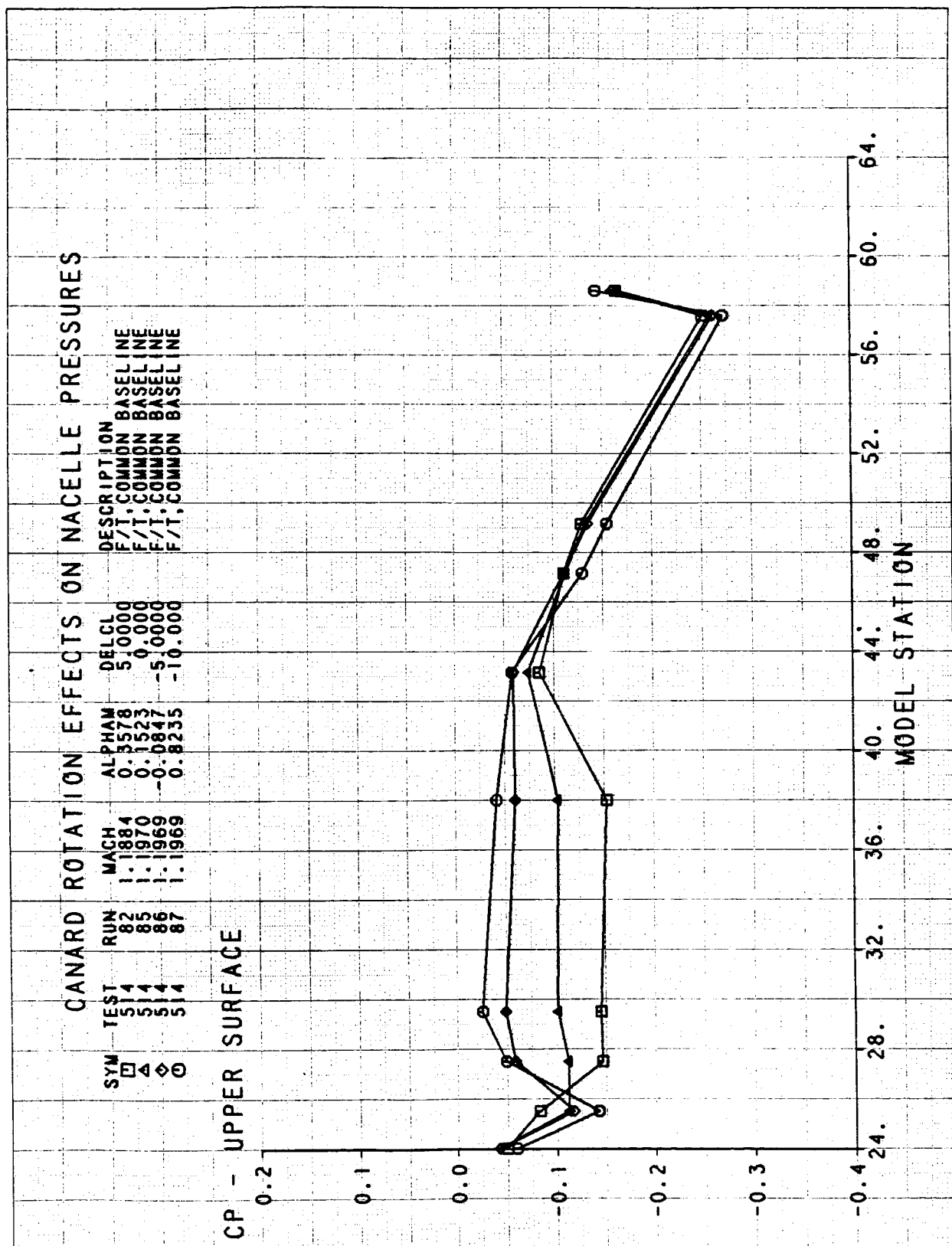


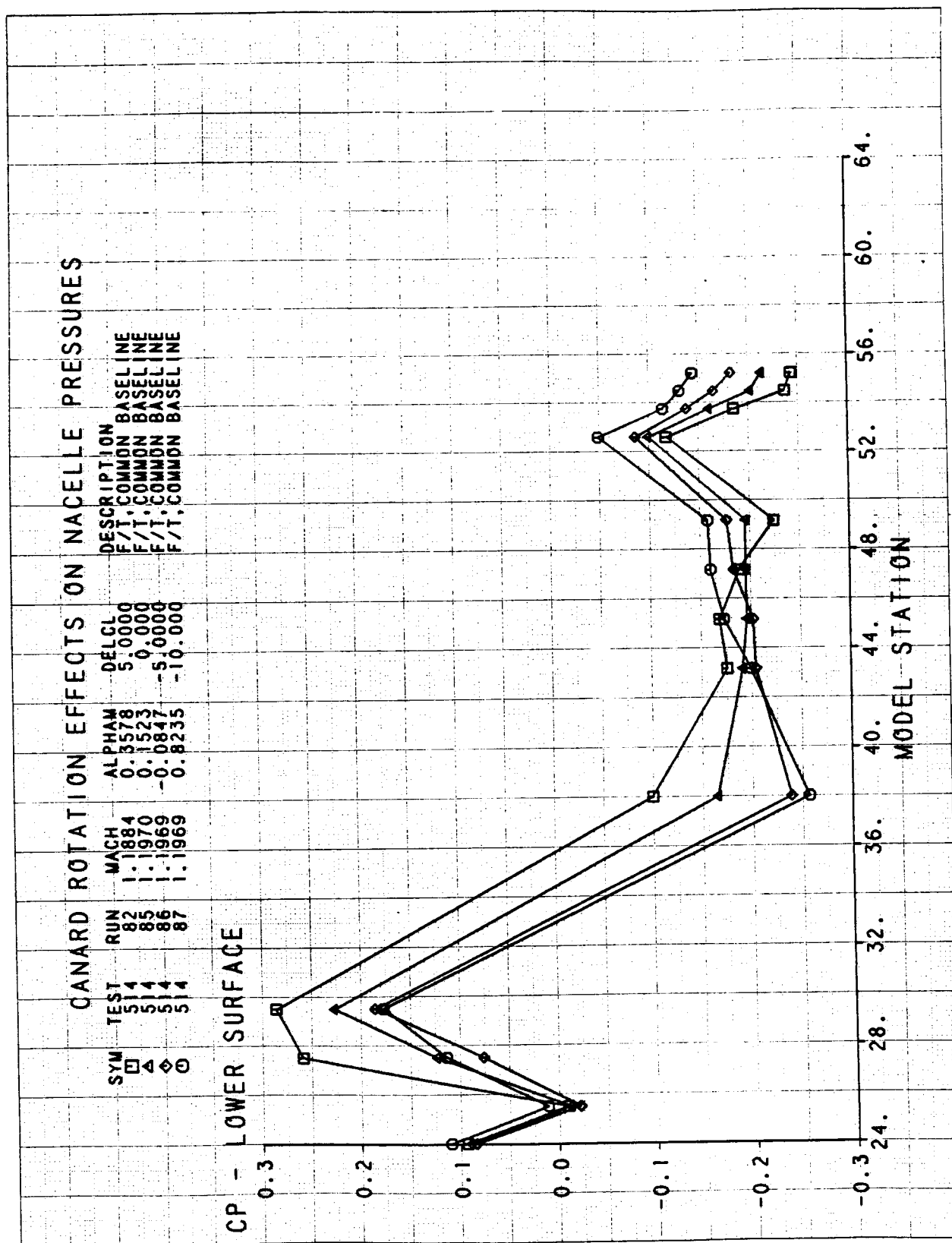
## CANARD ROTATION EFFECTS ON INNER WING PRESSURES

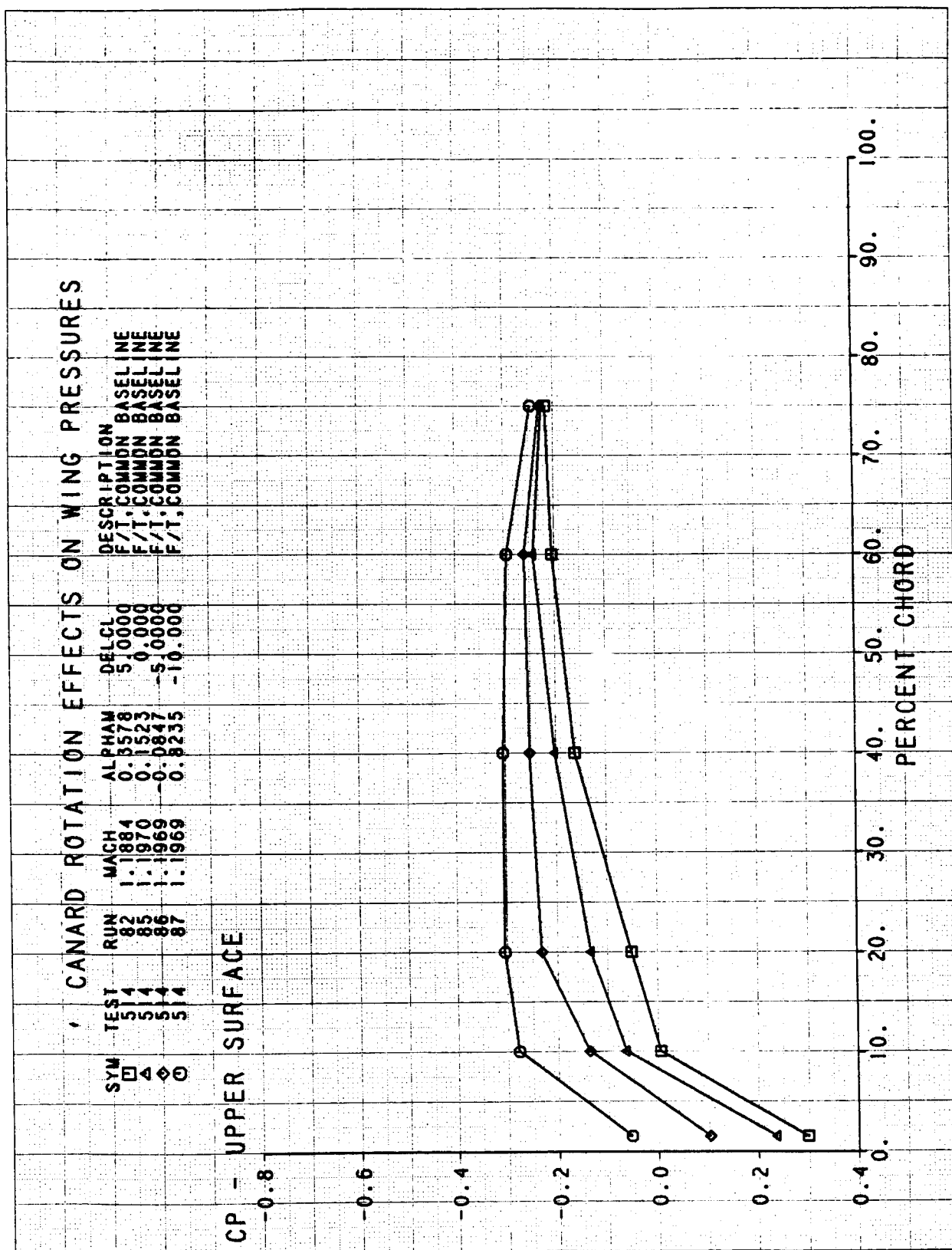
SYN	TEST	RUN	MACH	ALPHA	DELCL	DESCRIPTION
□	514	77	0.9038	0.2907	5.0000	F/T, COMMON BASELINE
△	514	78	0.9010	0.1075	0.0000	F/T, COMMON BASELINE
◇	514	79	0.9018	-0.0887	-5.0000	F/T, COMMON BASELINE
○	514	80	0.9011	0.8370	-10.0000	F/T, COMMON BASELINE
✱	514	81	0.9021	0.7261	-15.0000	F/T, COMMON BASELINE

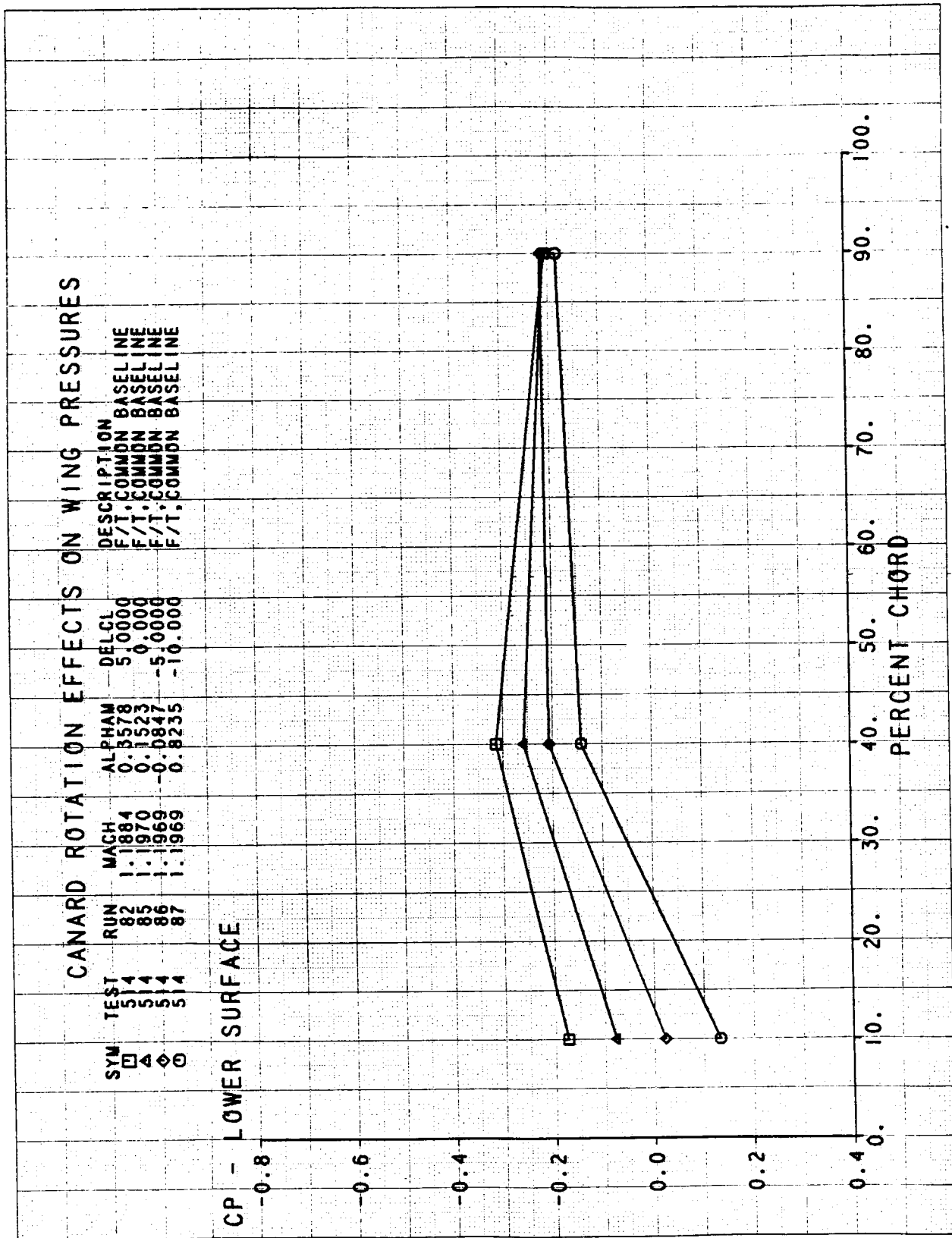
CP - LOWER SURFACE

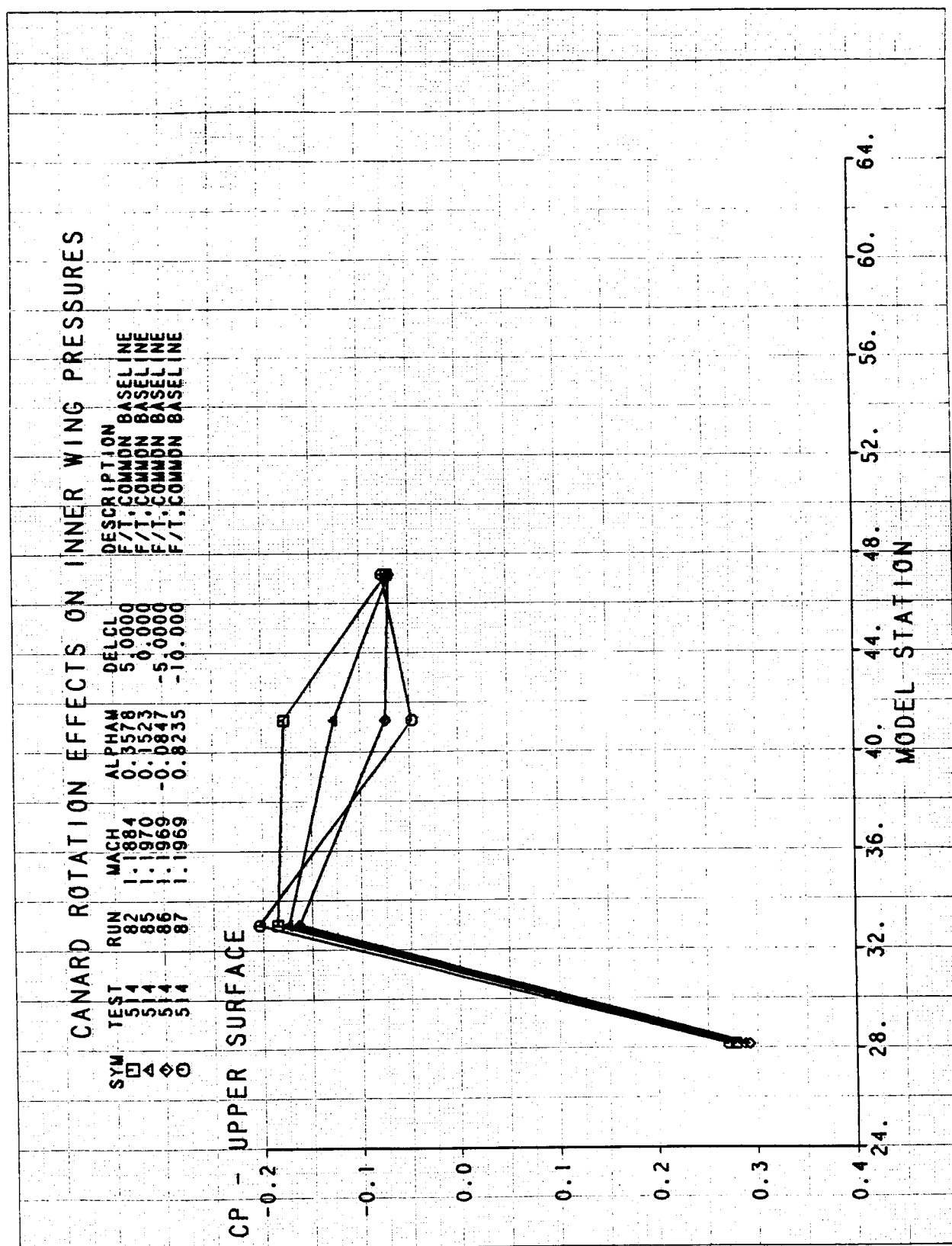




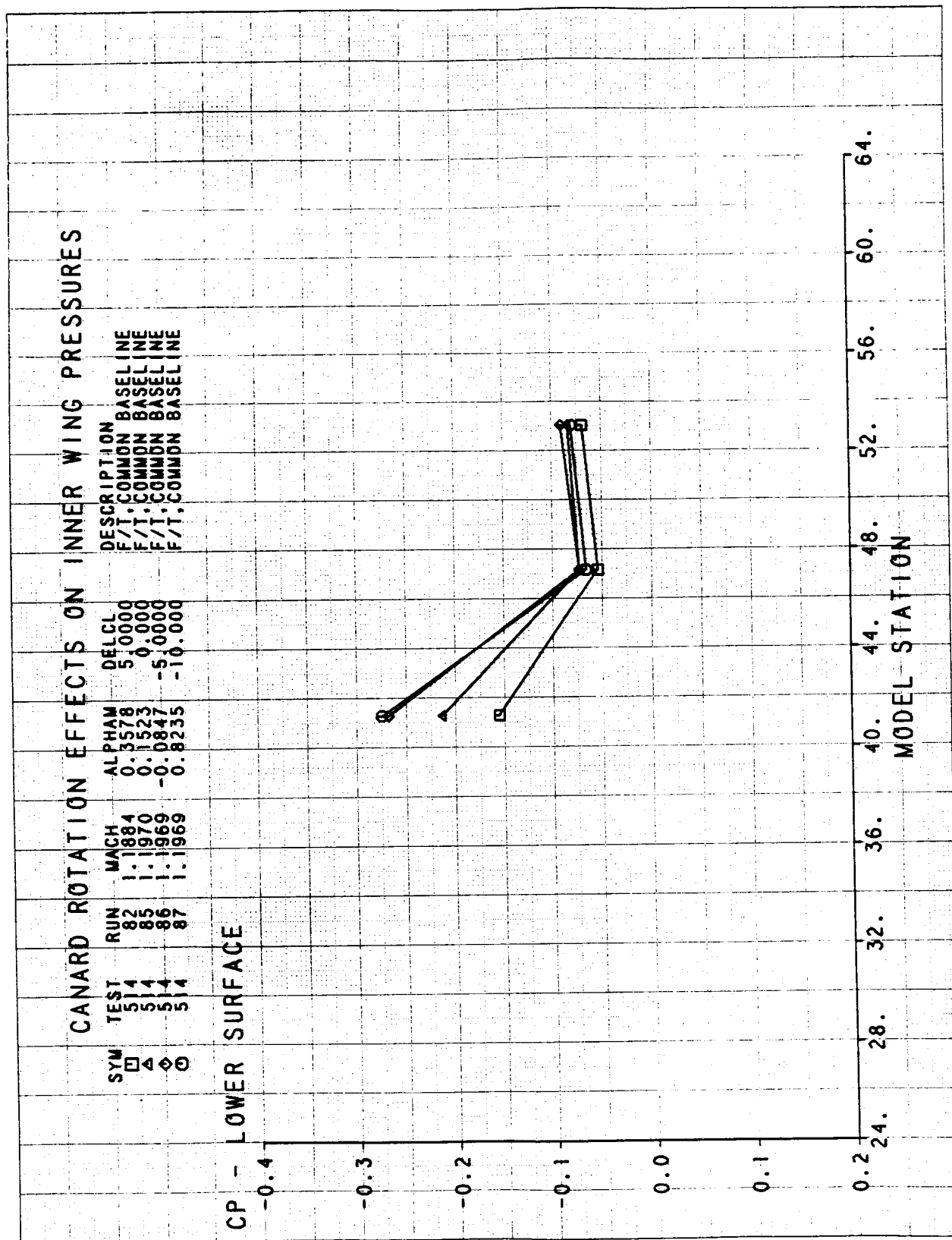


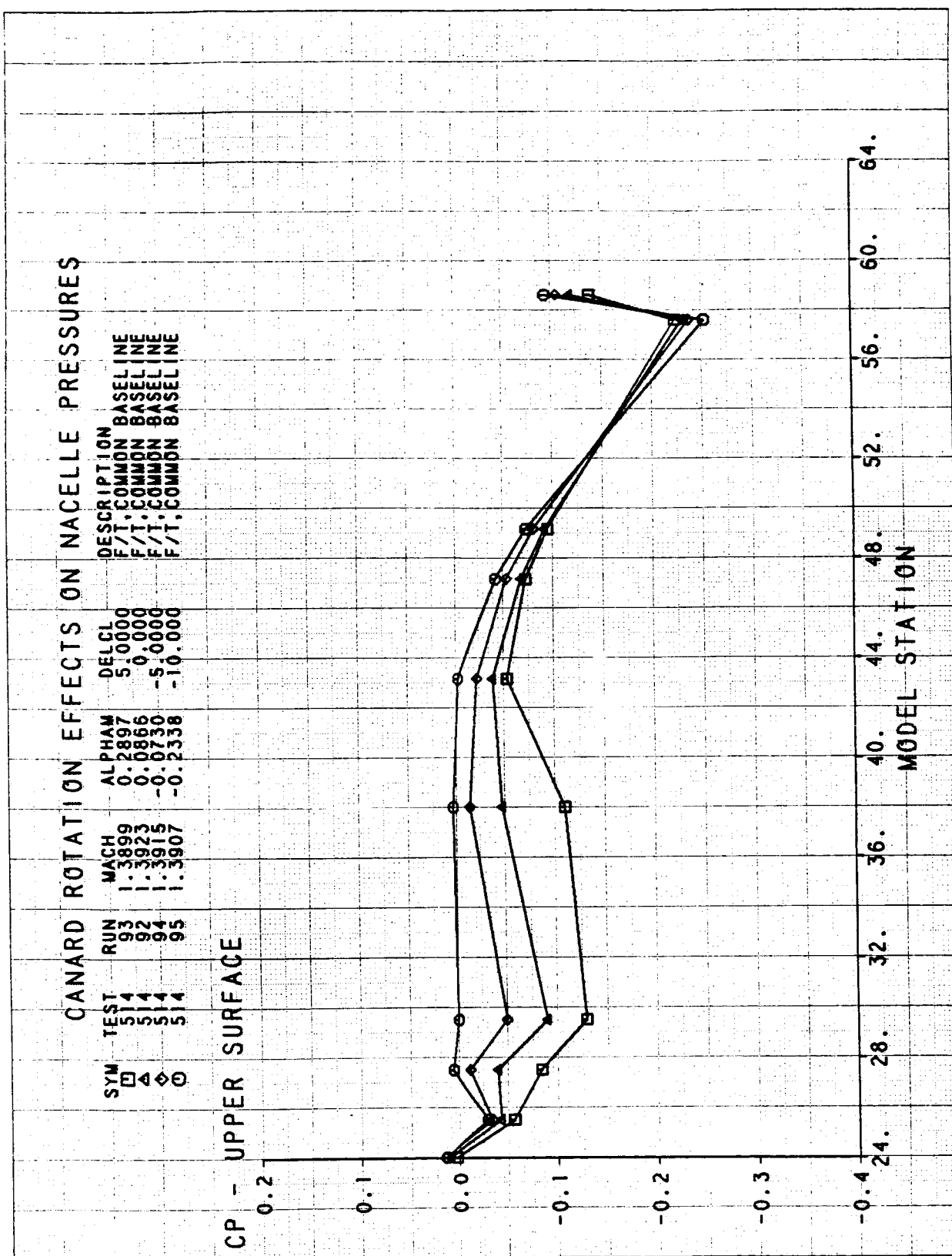


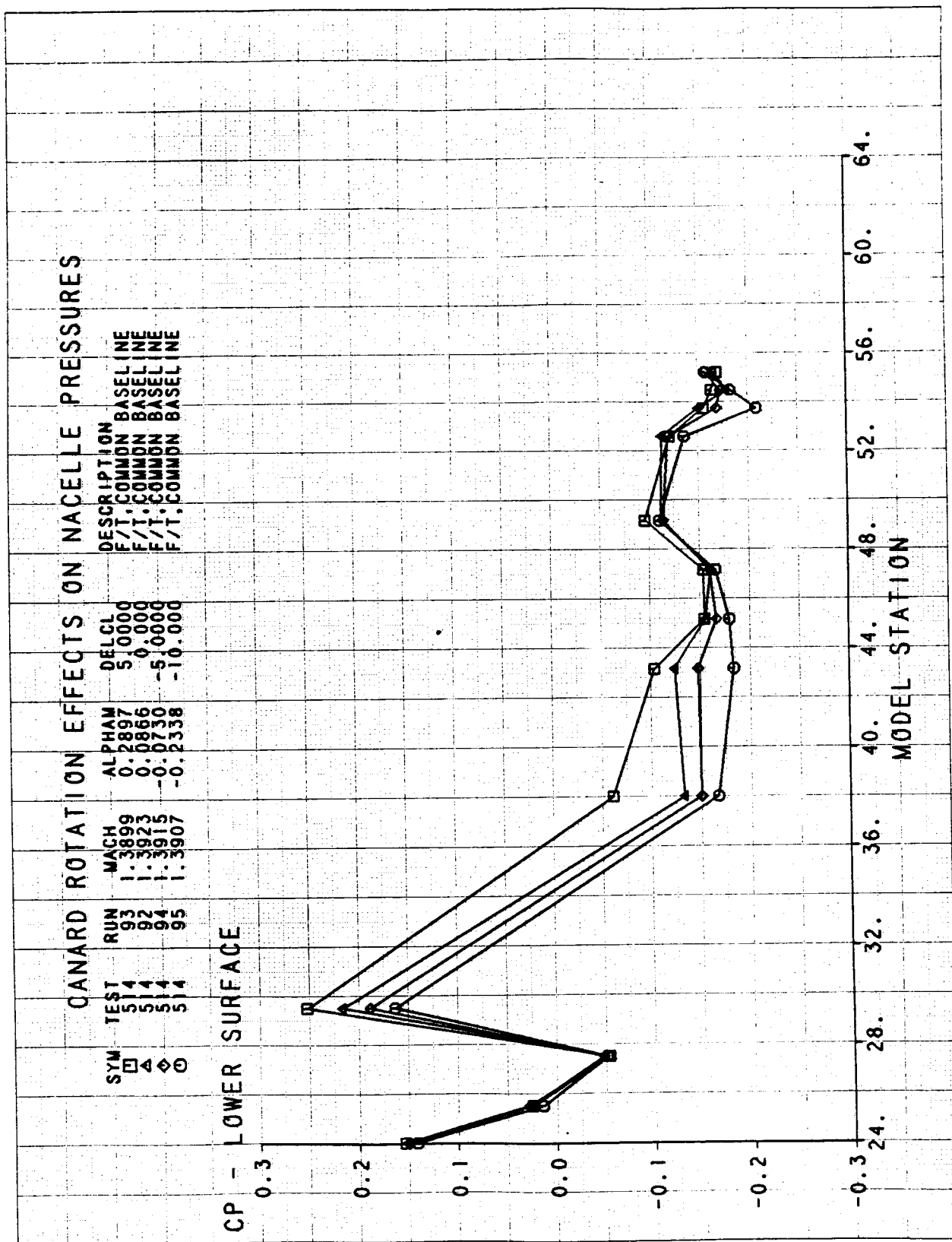


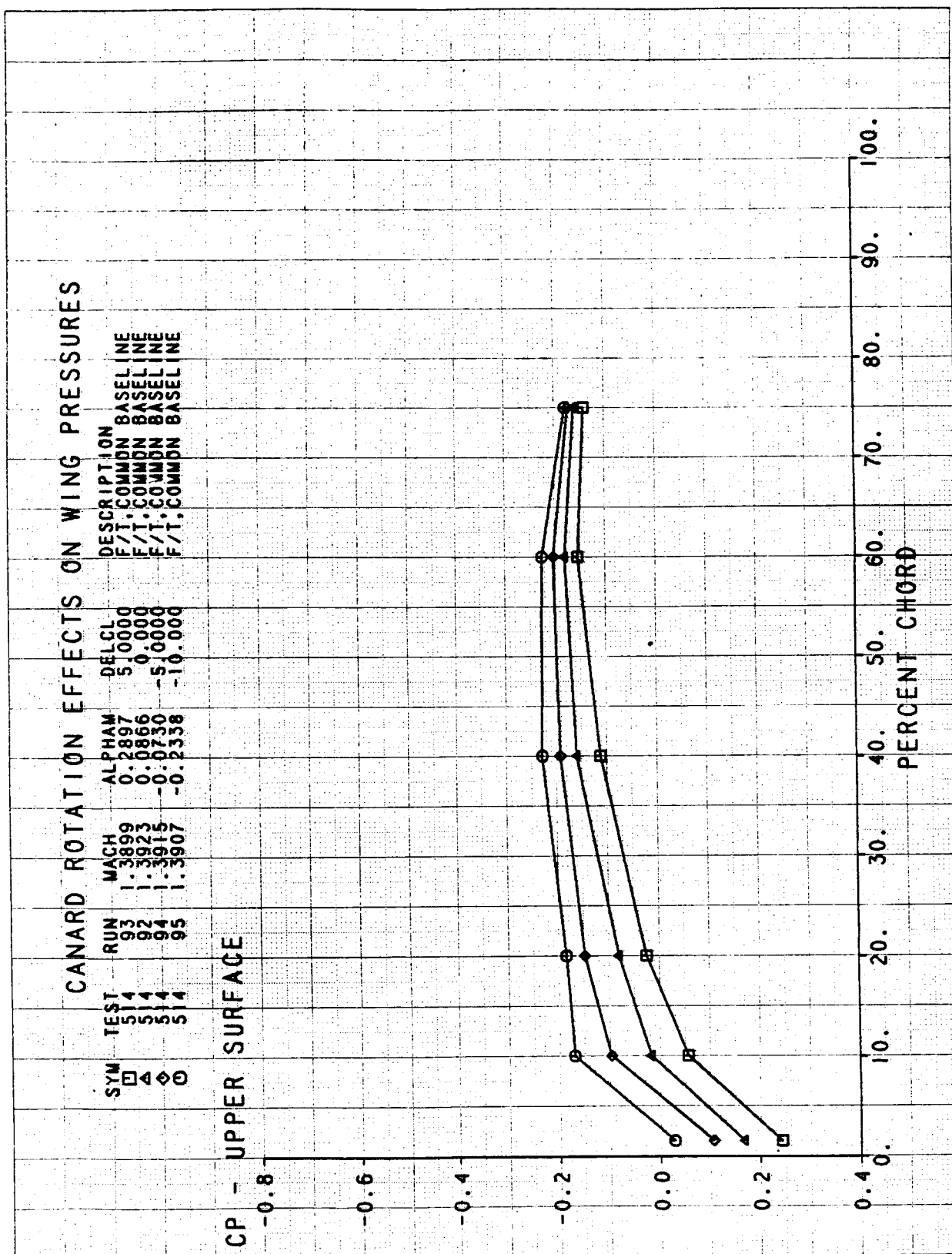








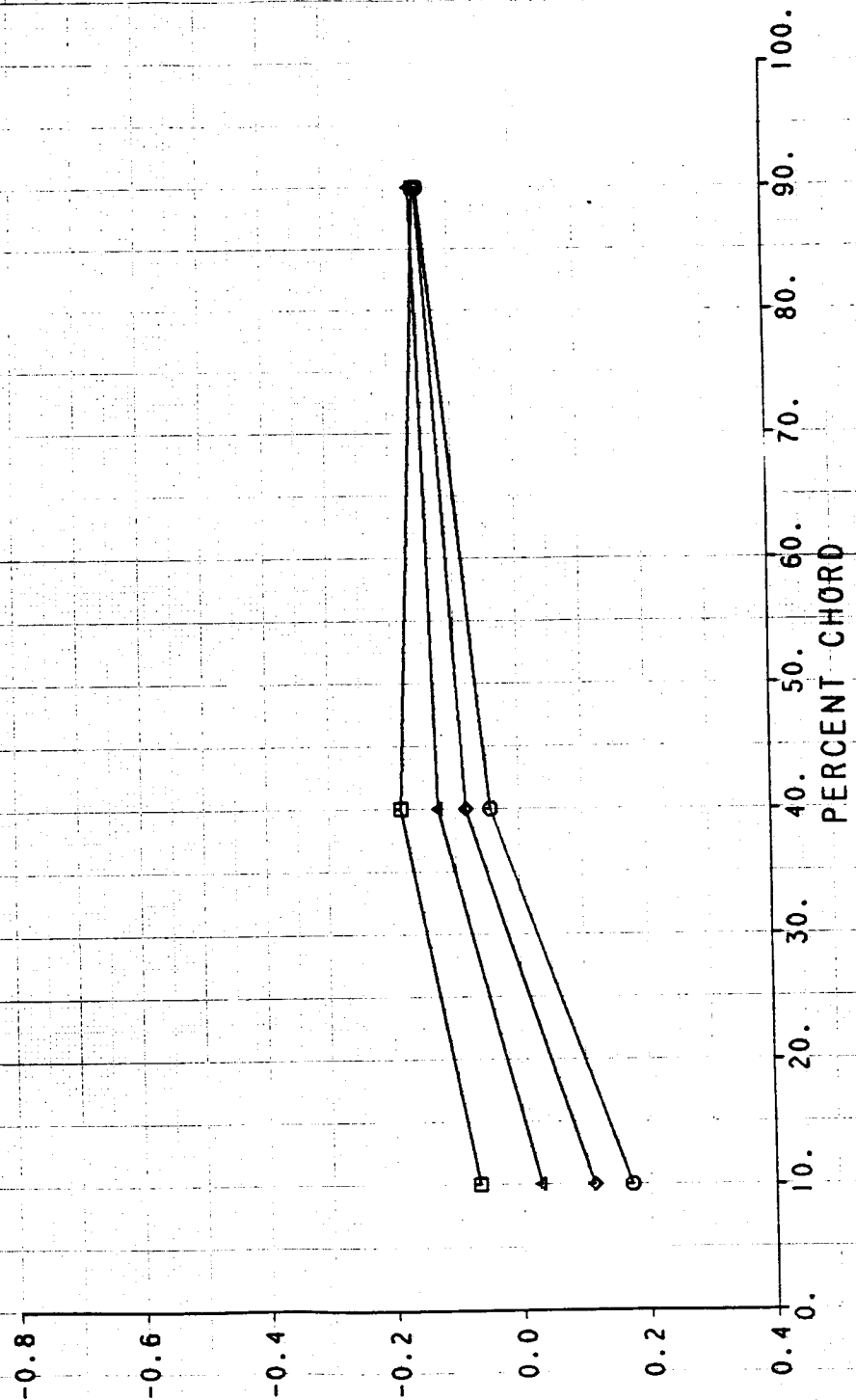


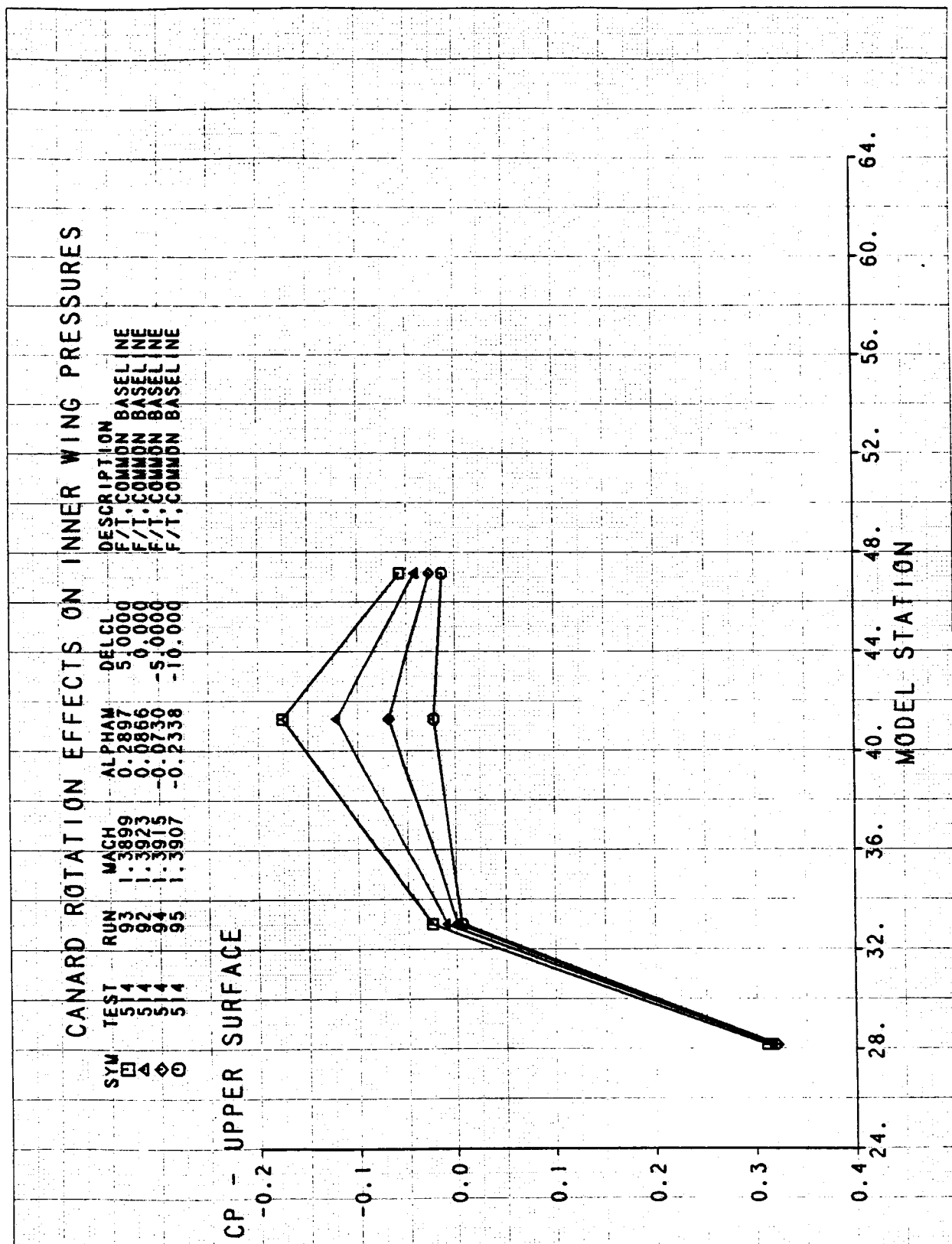


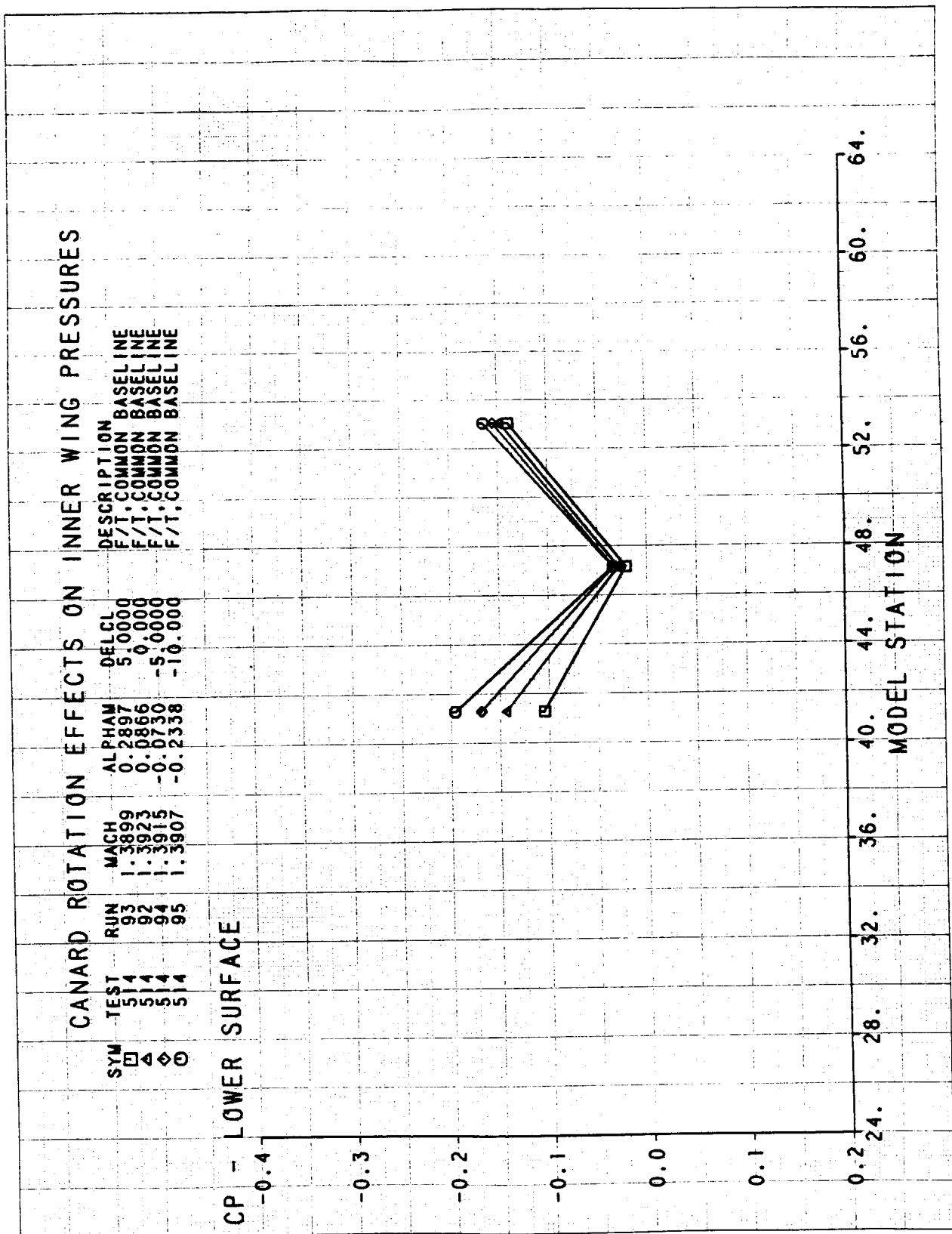
# CANARD ROTATION EFFECTS ON WING PRESSURES

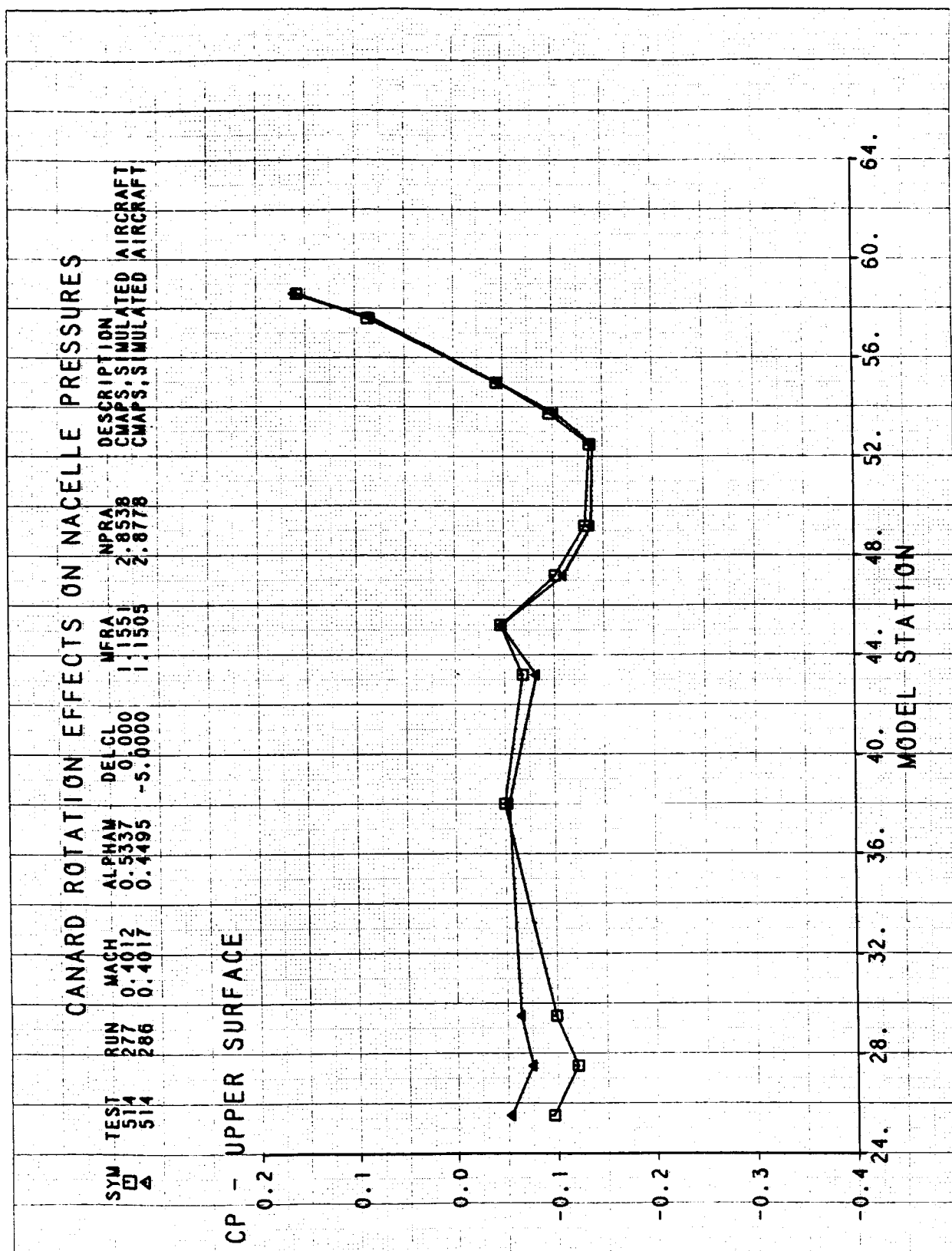
SYM	TEST	RUN	MACH	ALPHAM	DELCL	DESCRIPTION
□	514	93	1.3899	0.2897	5.0000	F/T, COMMON BASELINE
△	514	92	1.3923	0.0866	0.0000	F/T, COMMON BASELINE
◇	514	94	1.3915	-0.0730	-5.0000	F/T, COMMON BASELINE
○	514	95	1.3907	-0.2338	-10.0000	F/T, COMMON BASELINE

CP - LOWER SURFACE

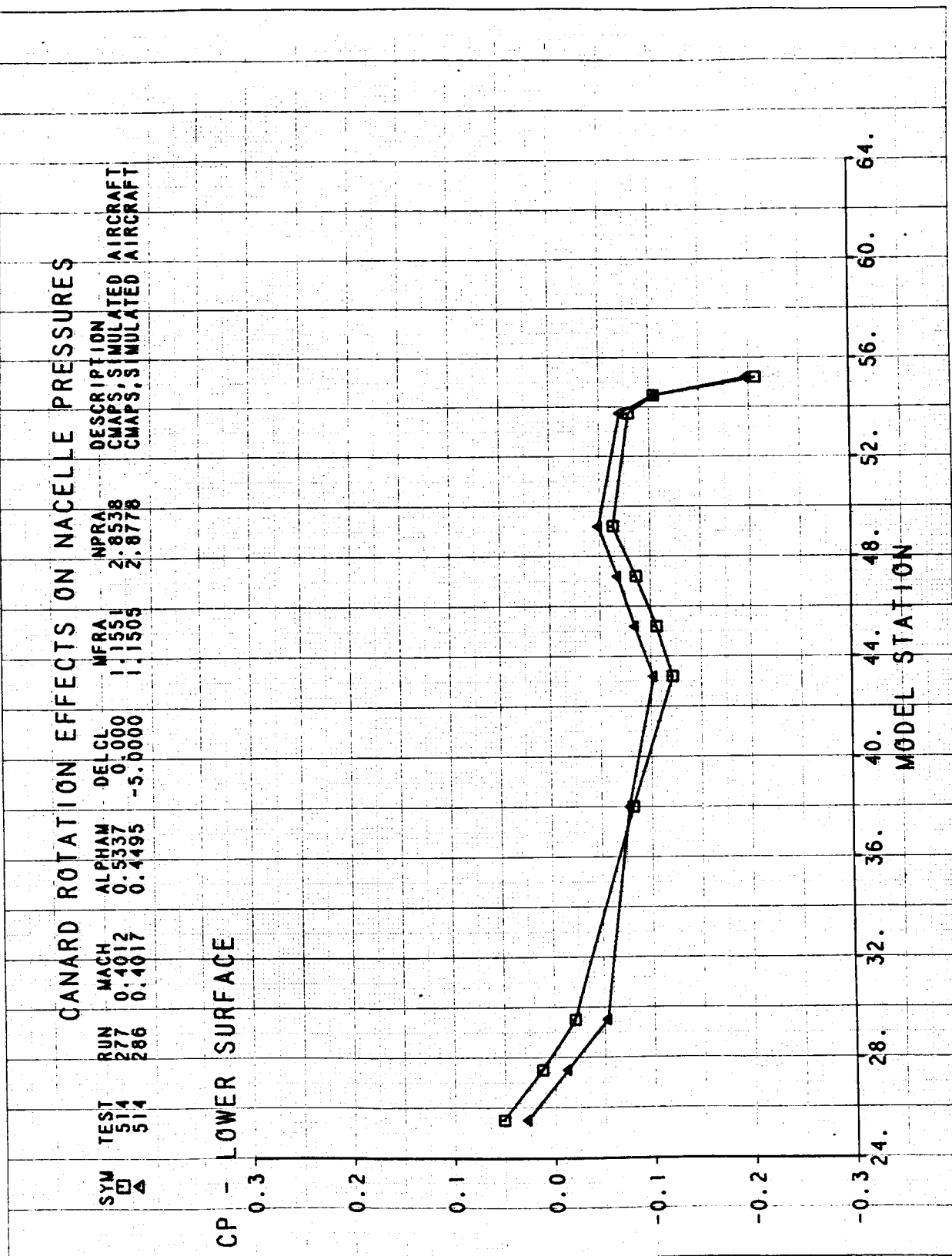


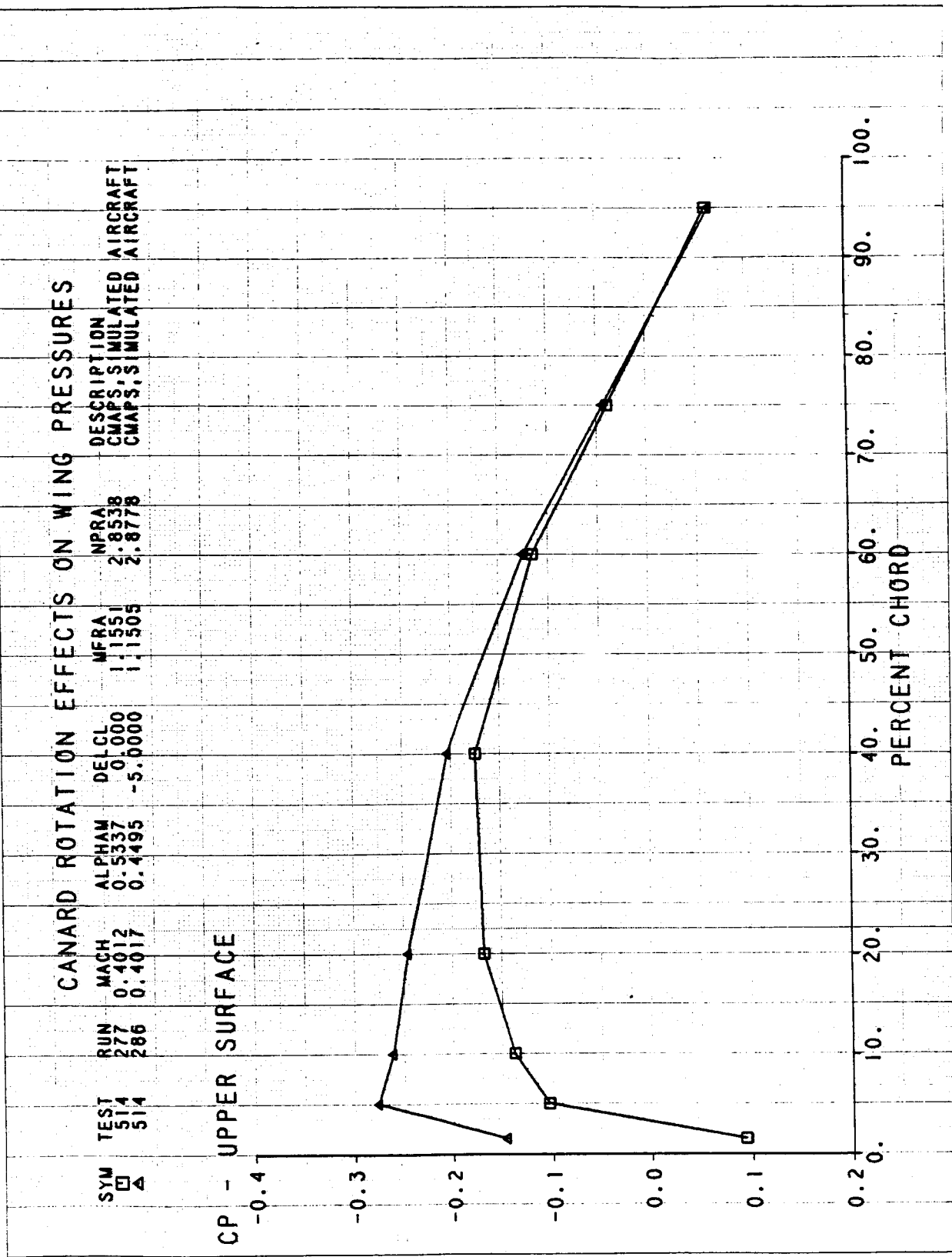


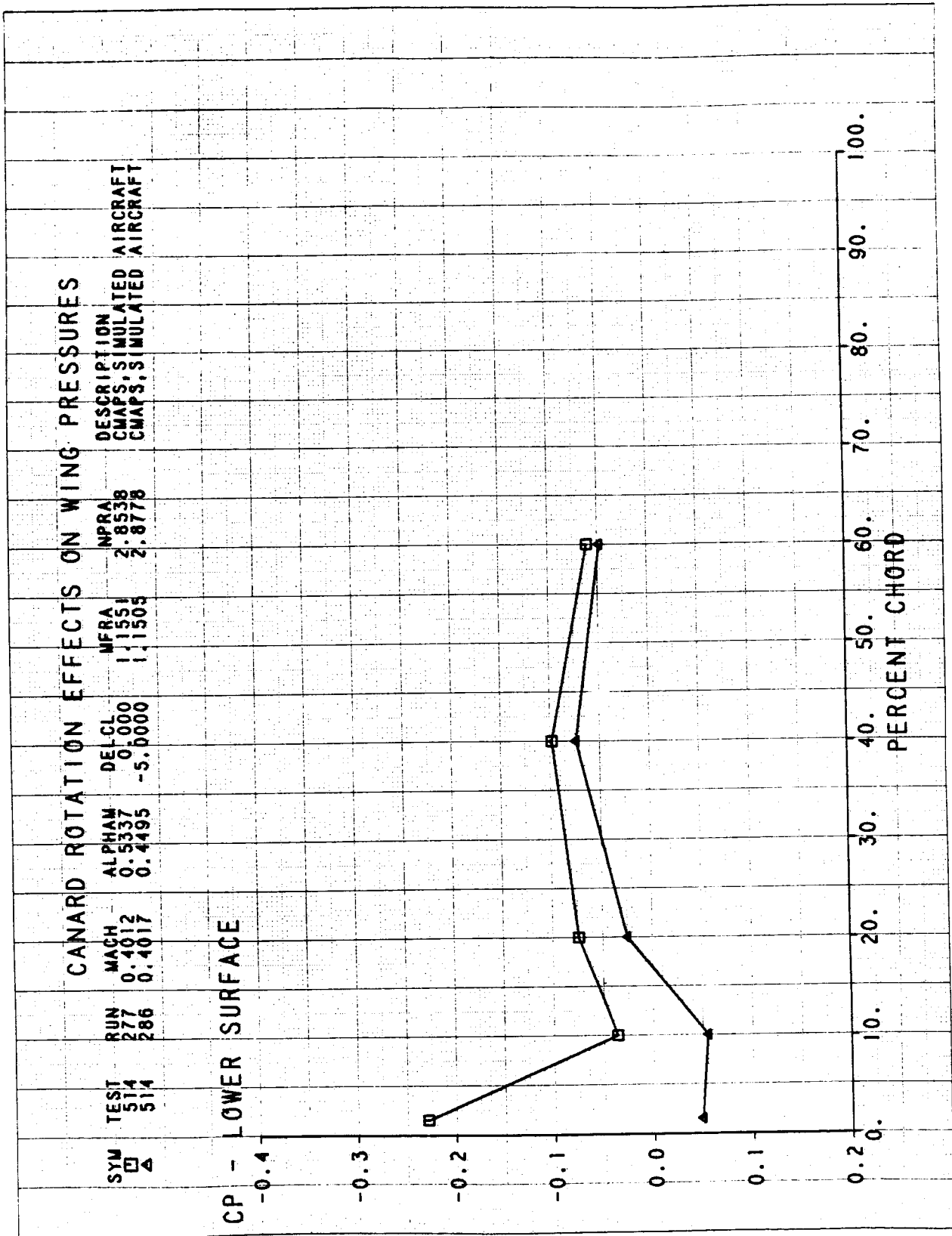


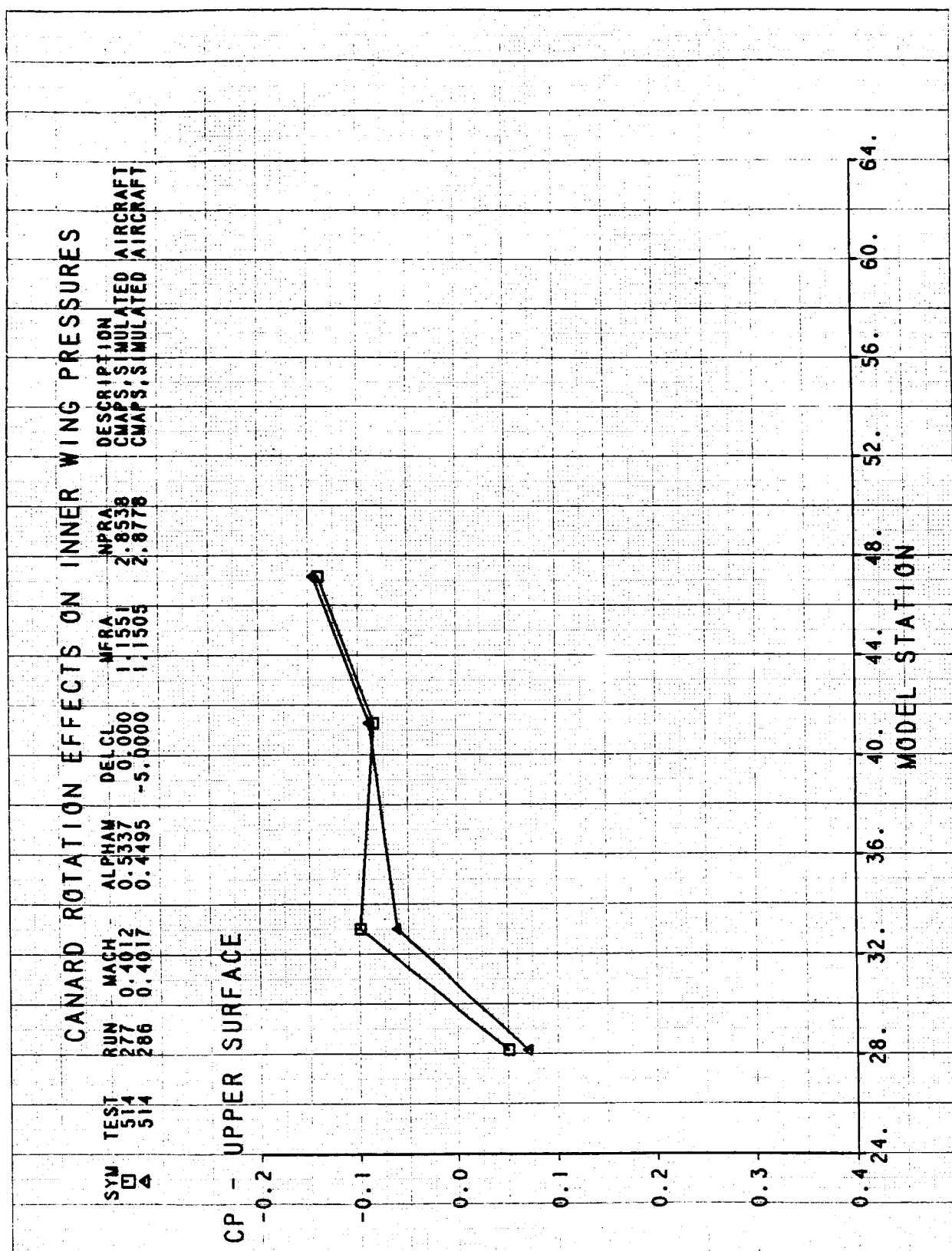


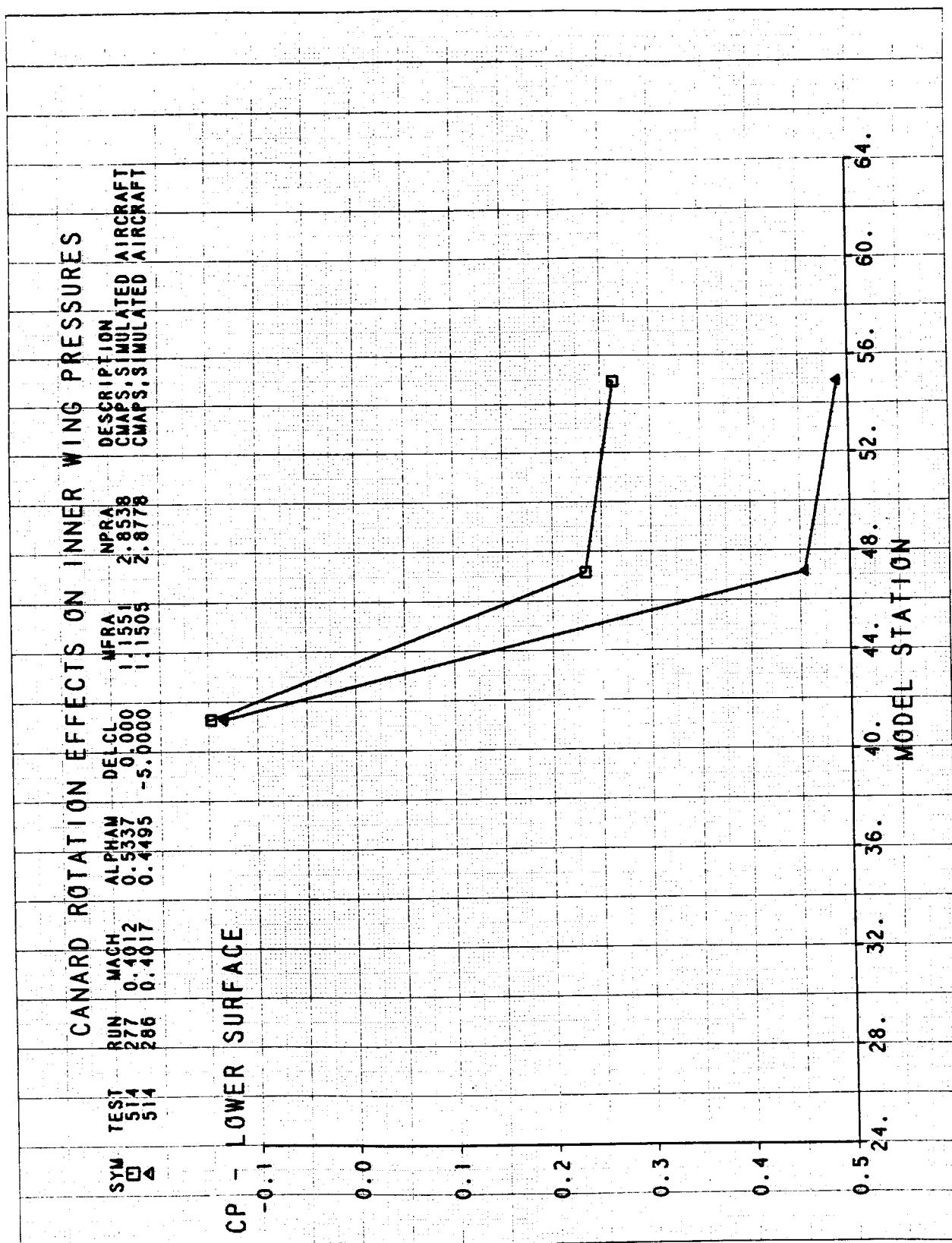


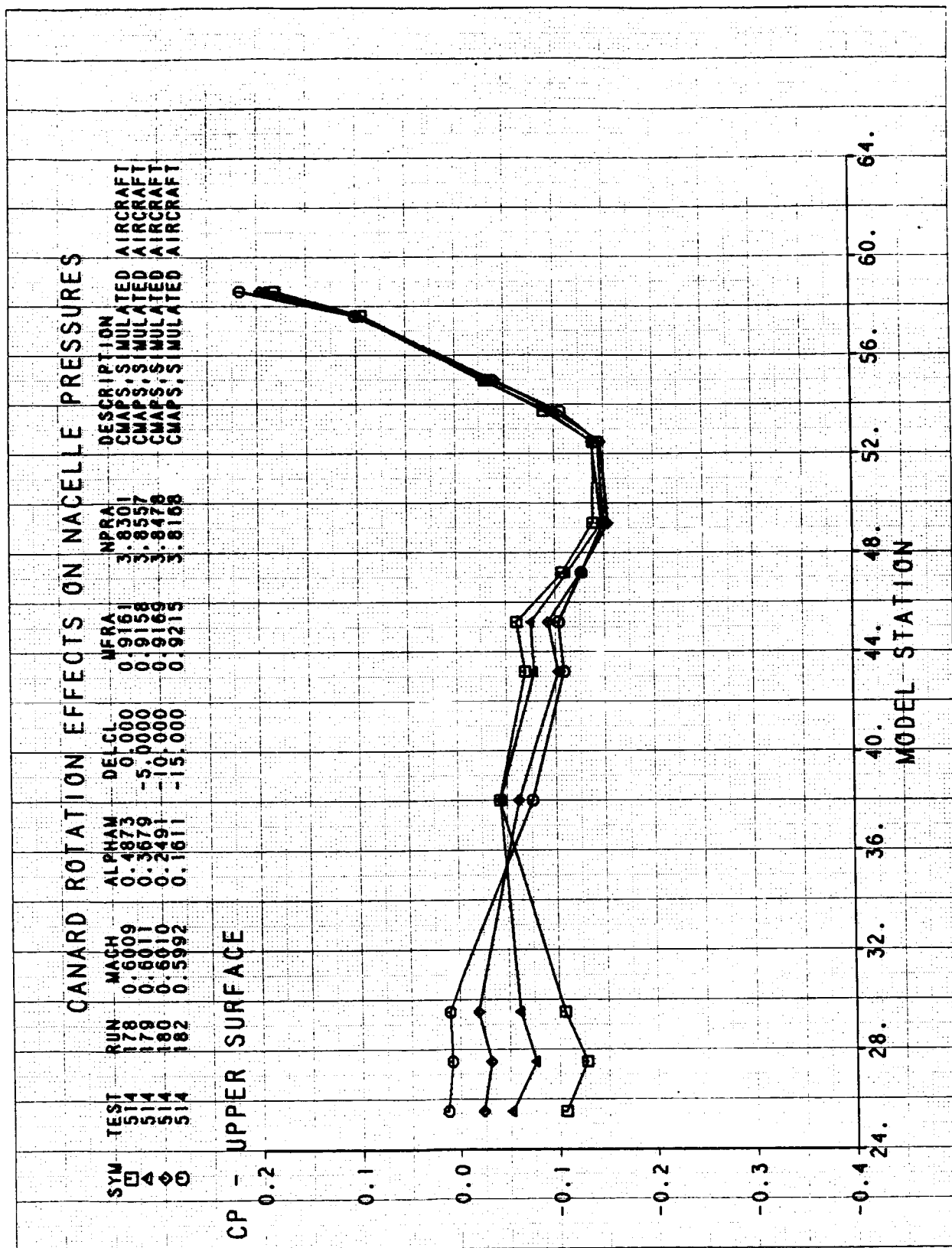


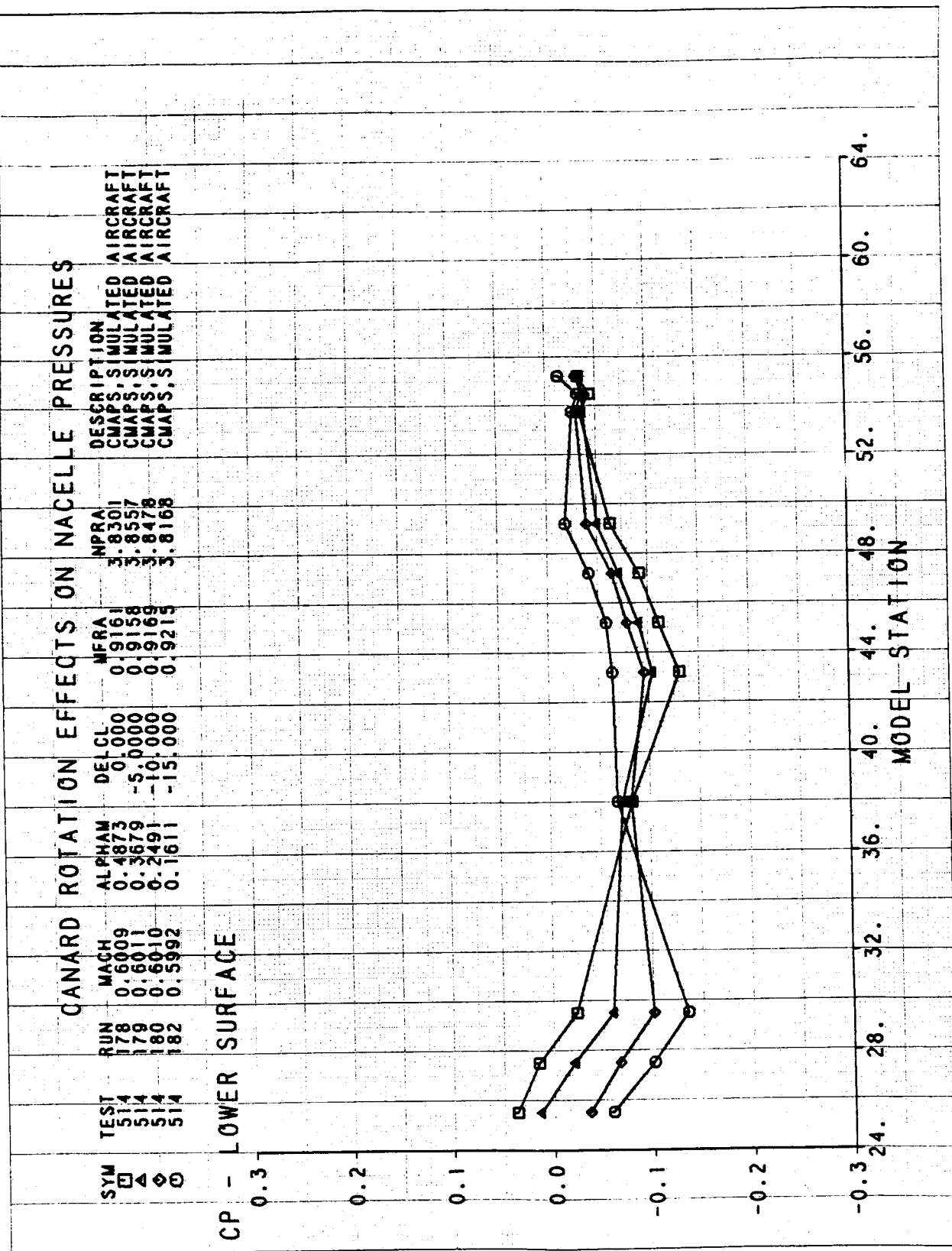


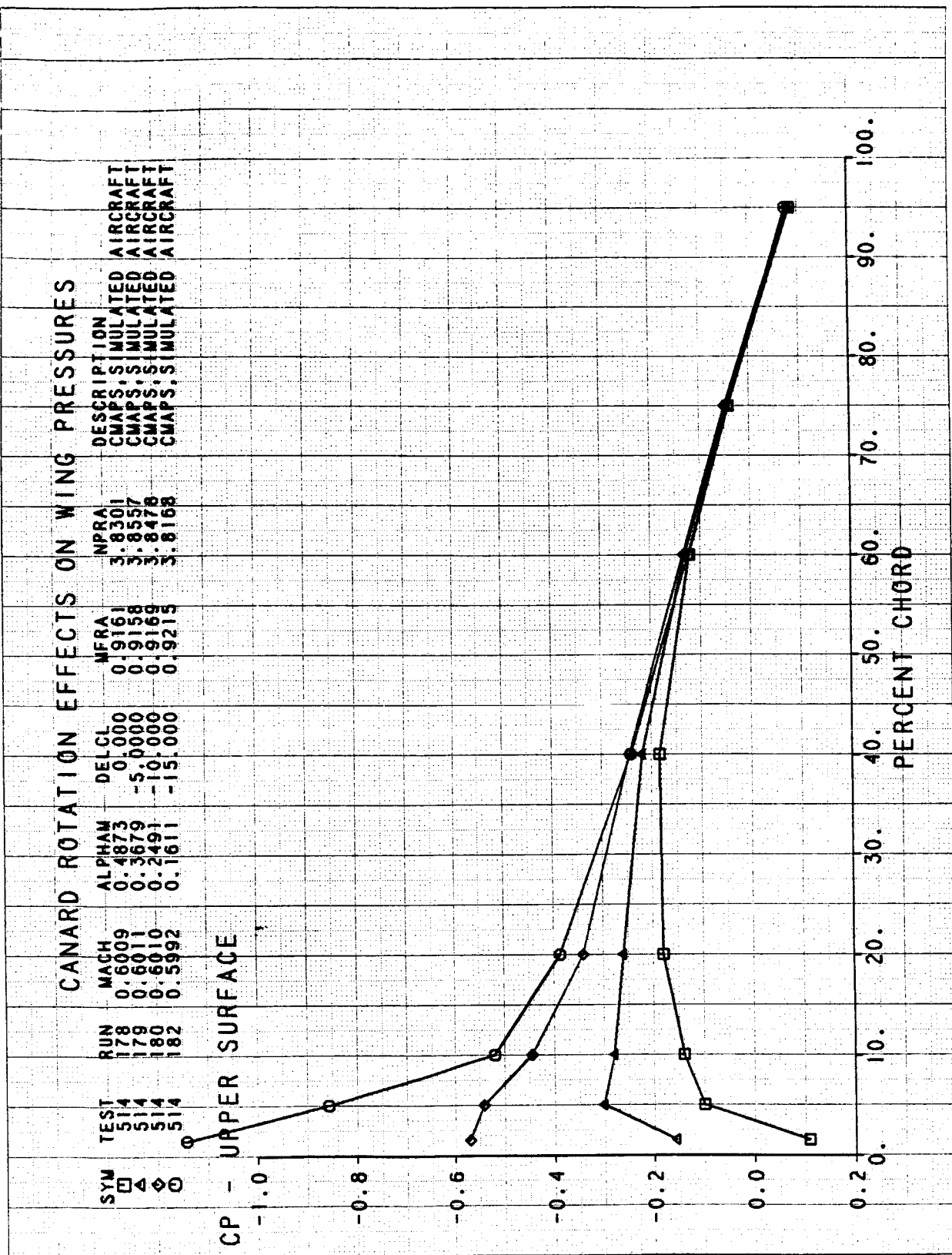




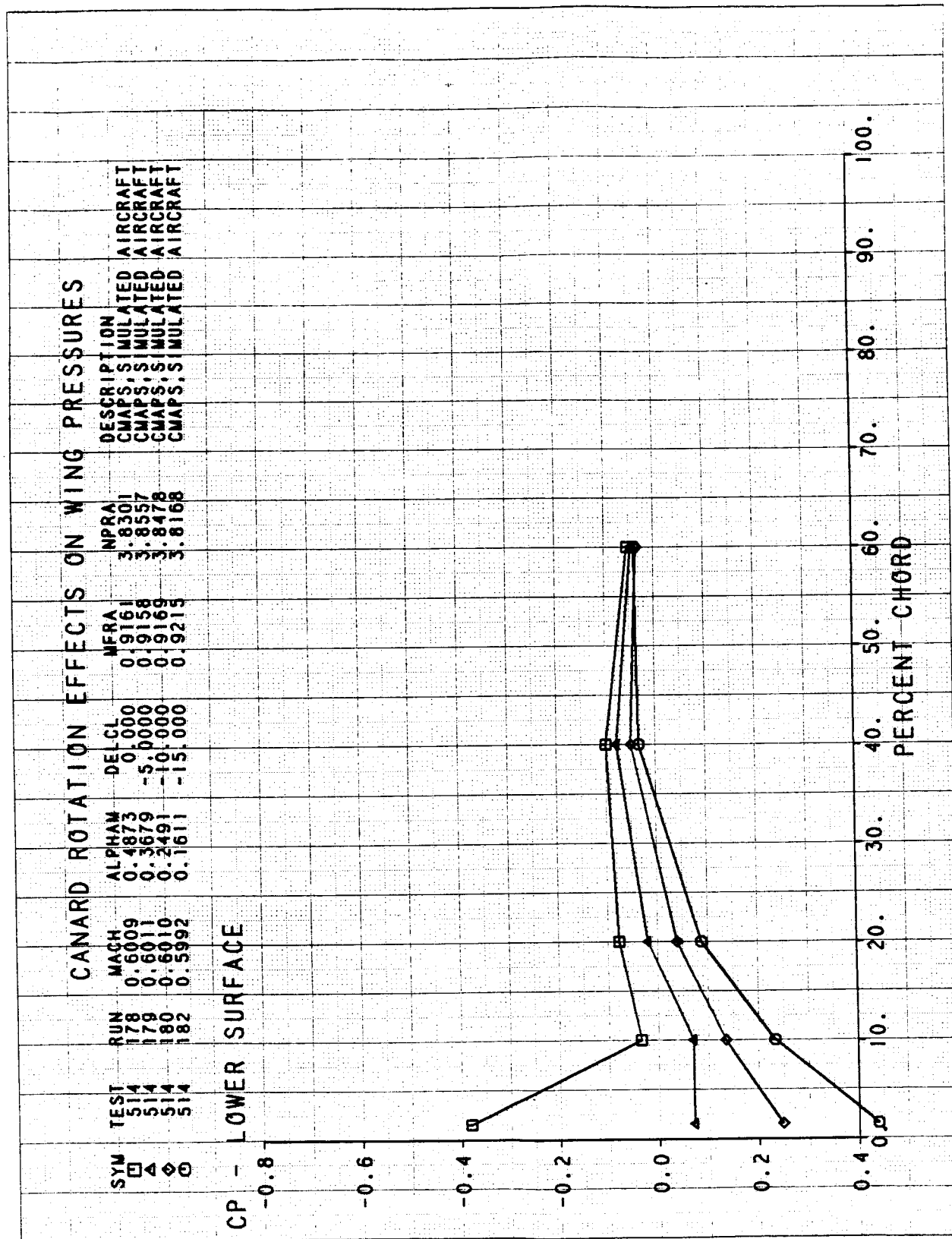


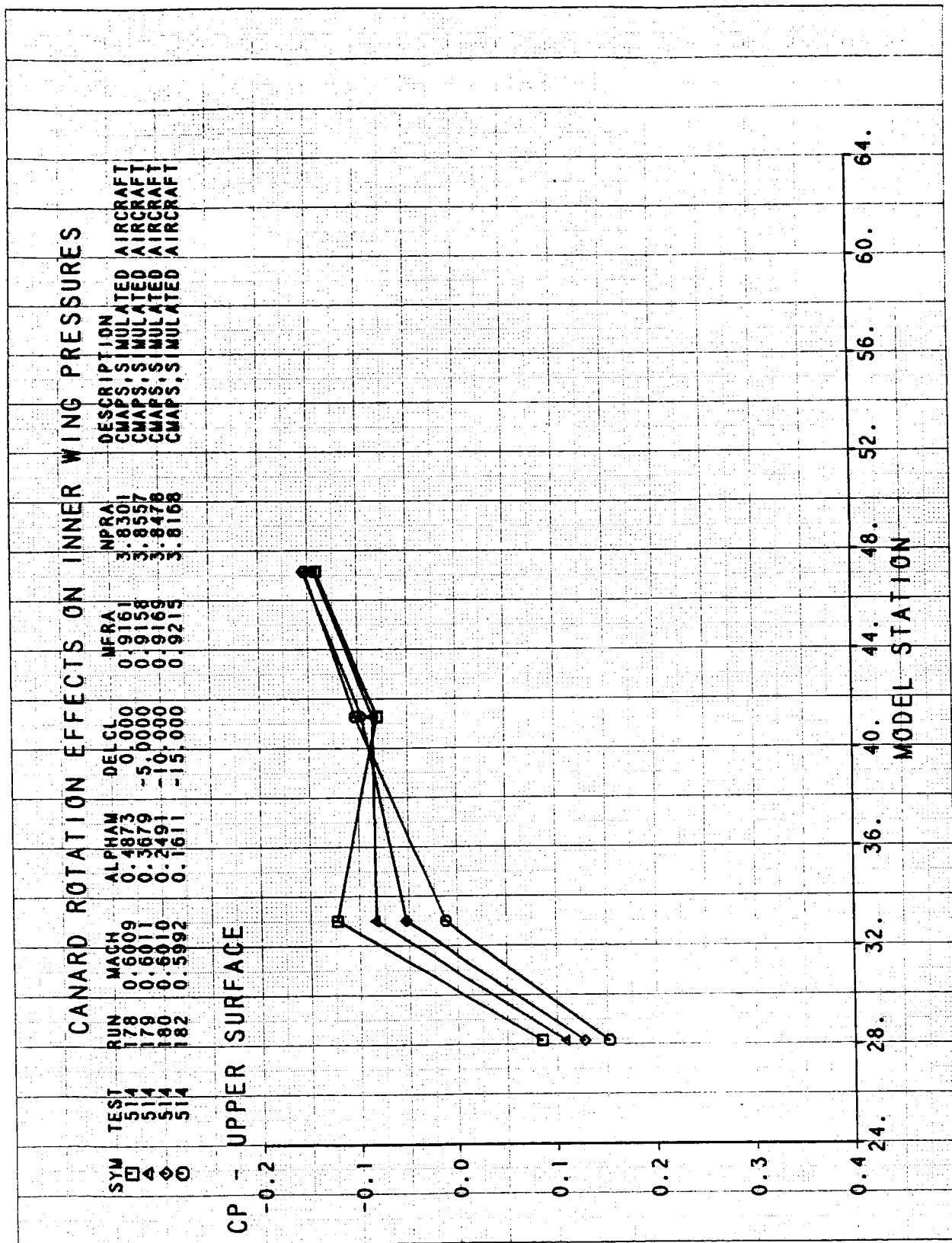


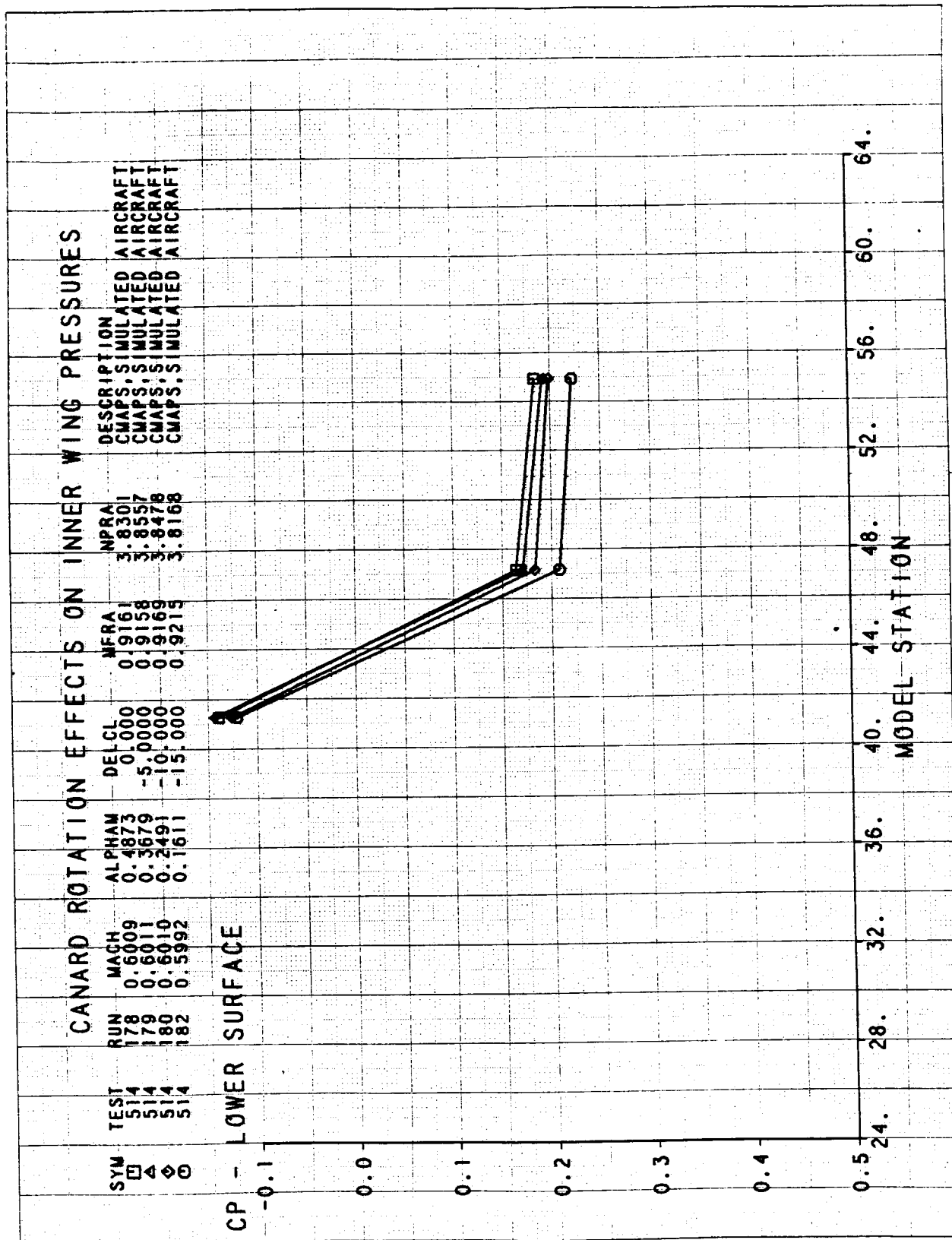


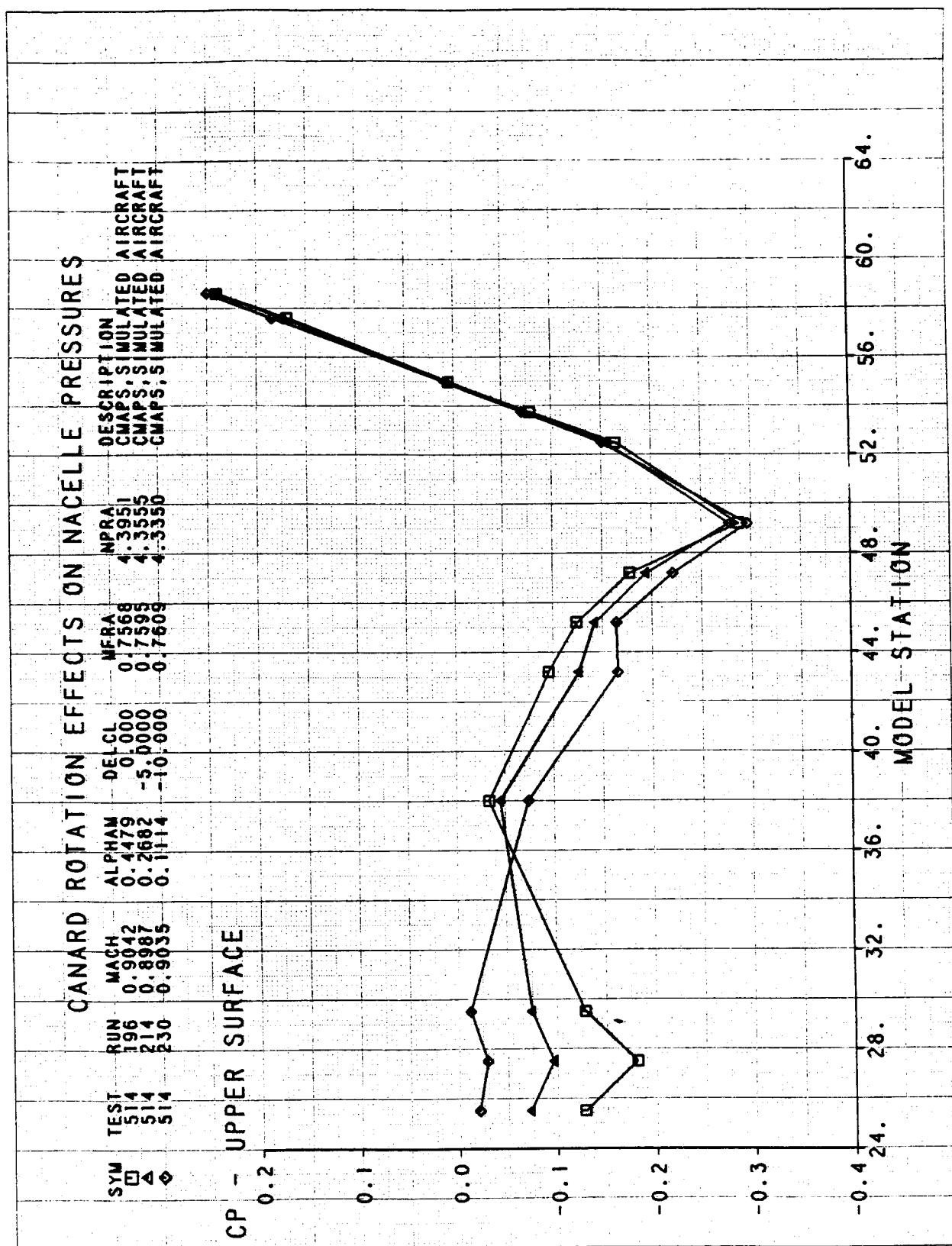


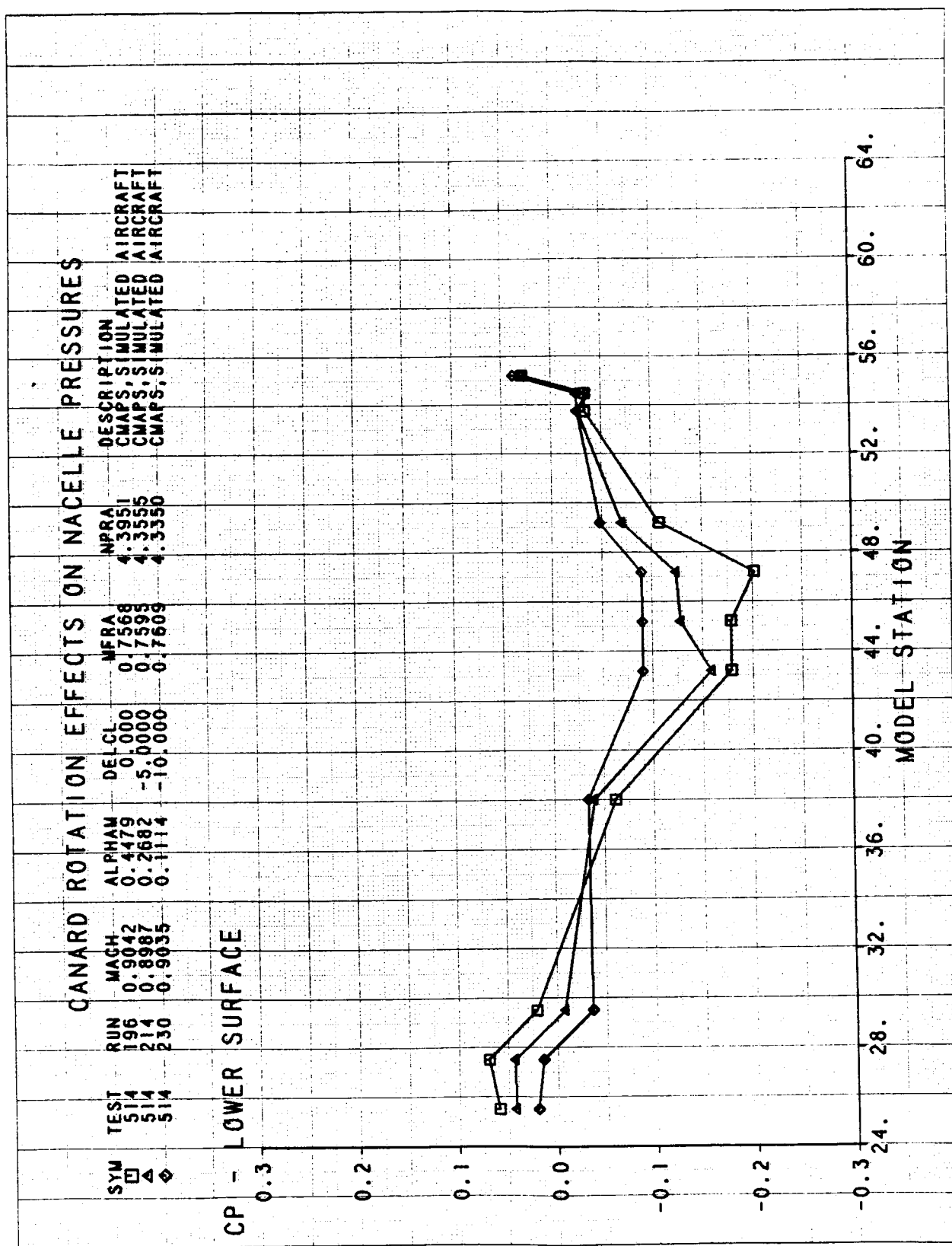


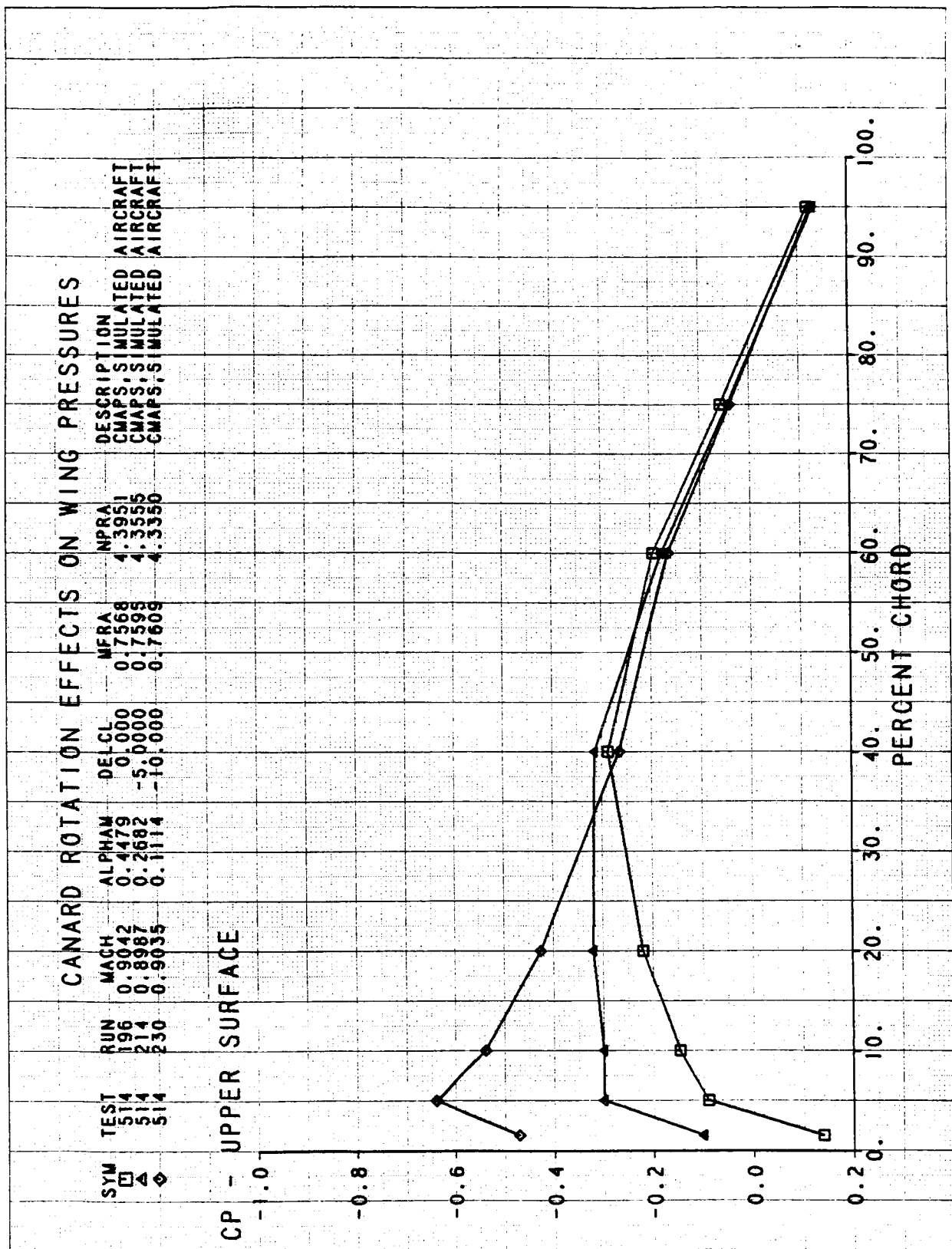


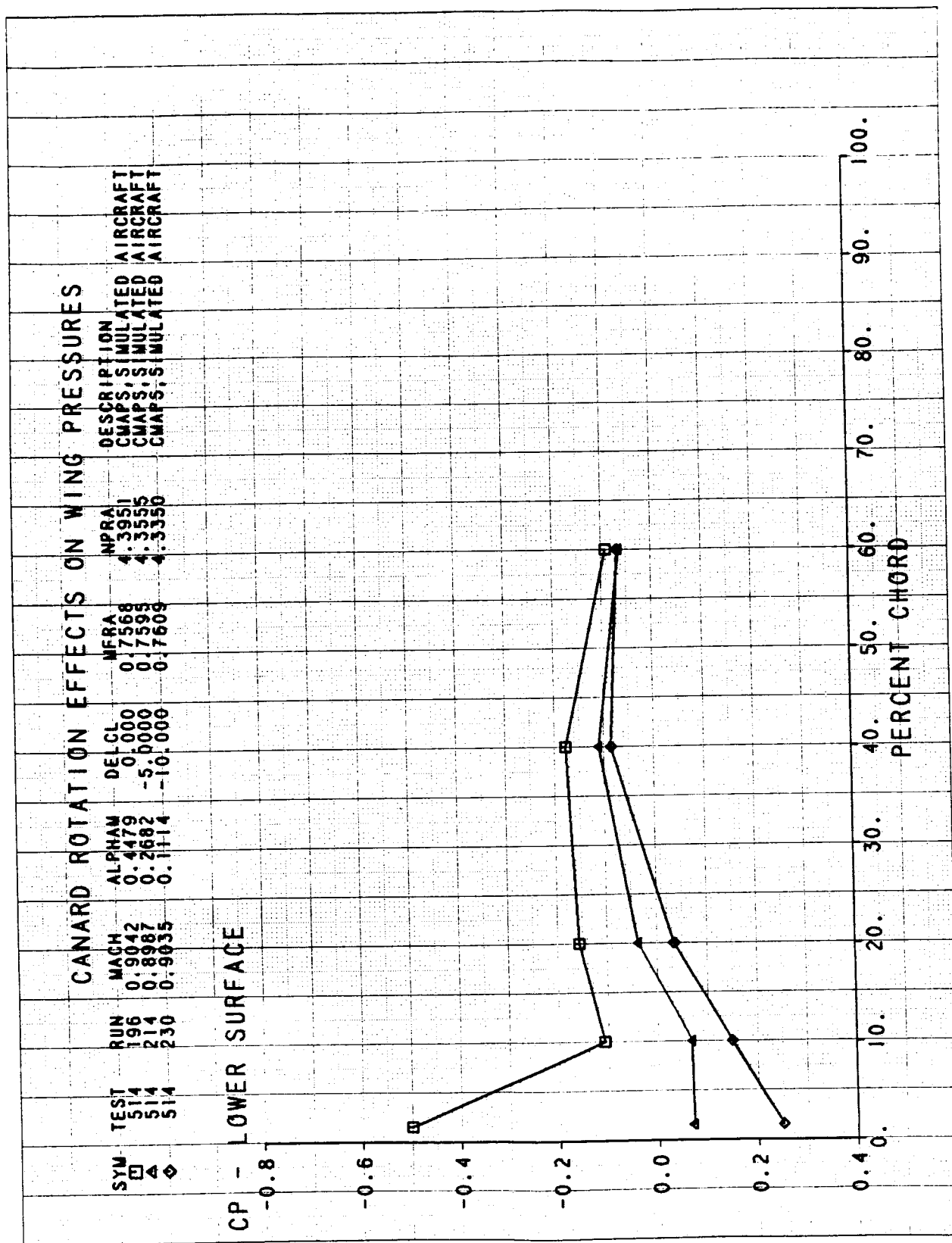


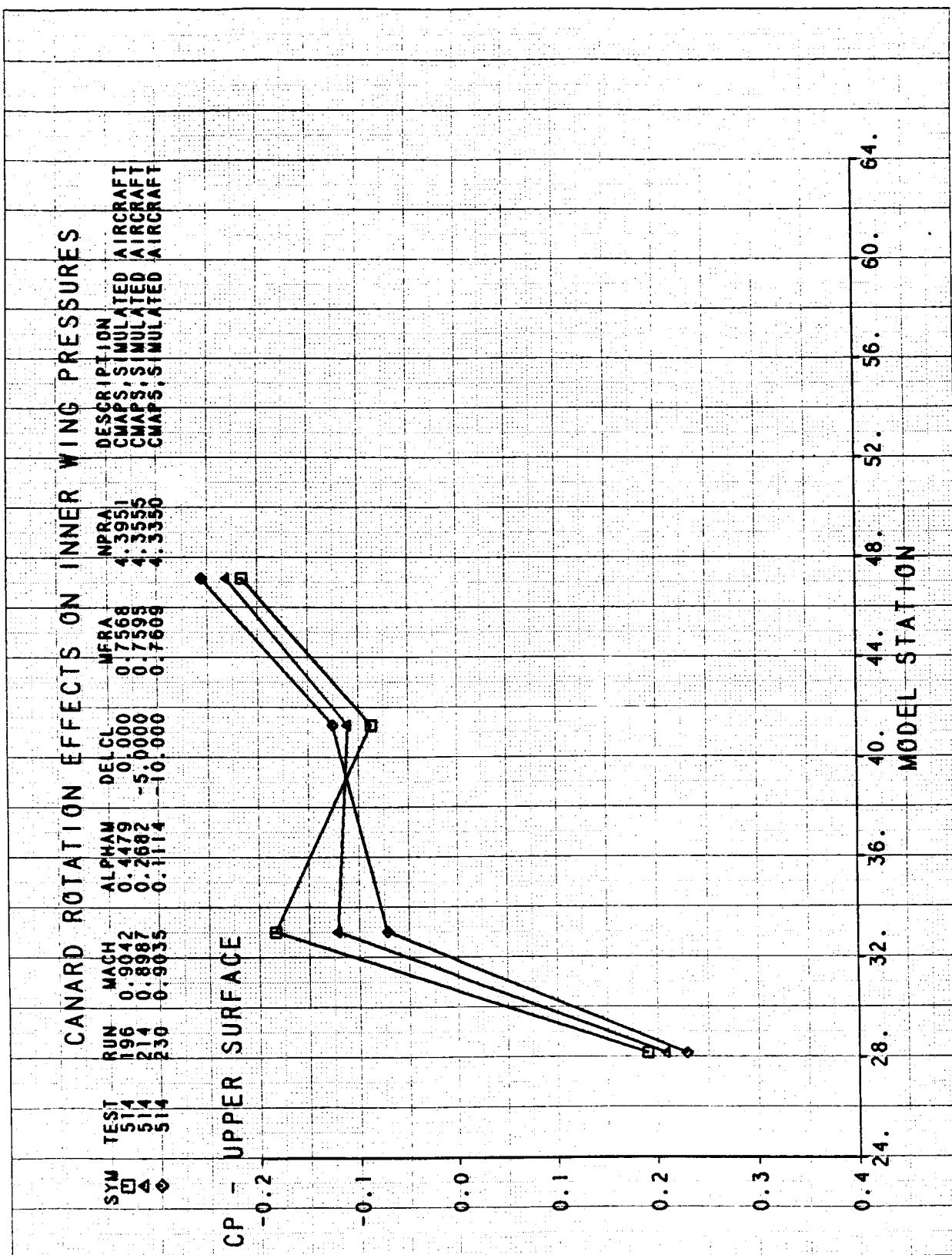




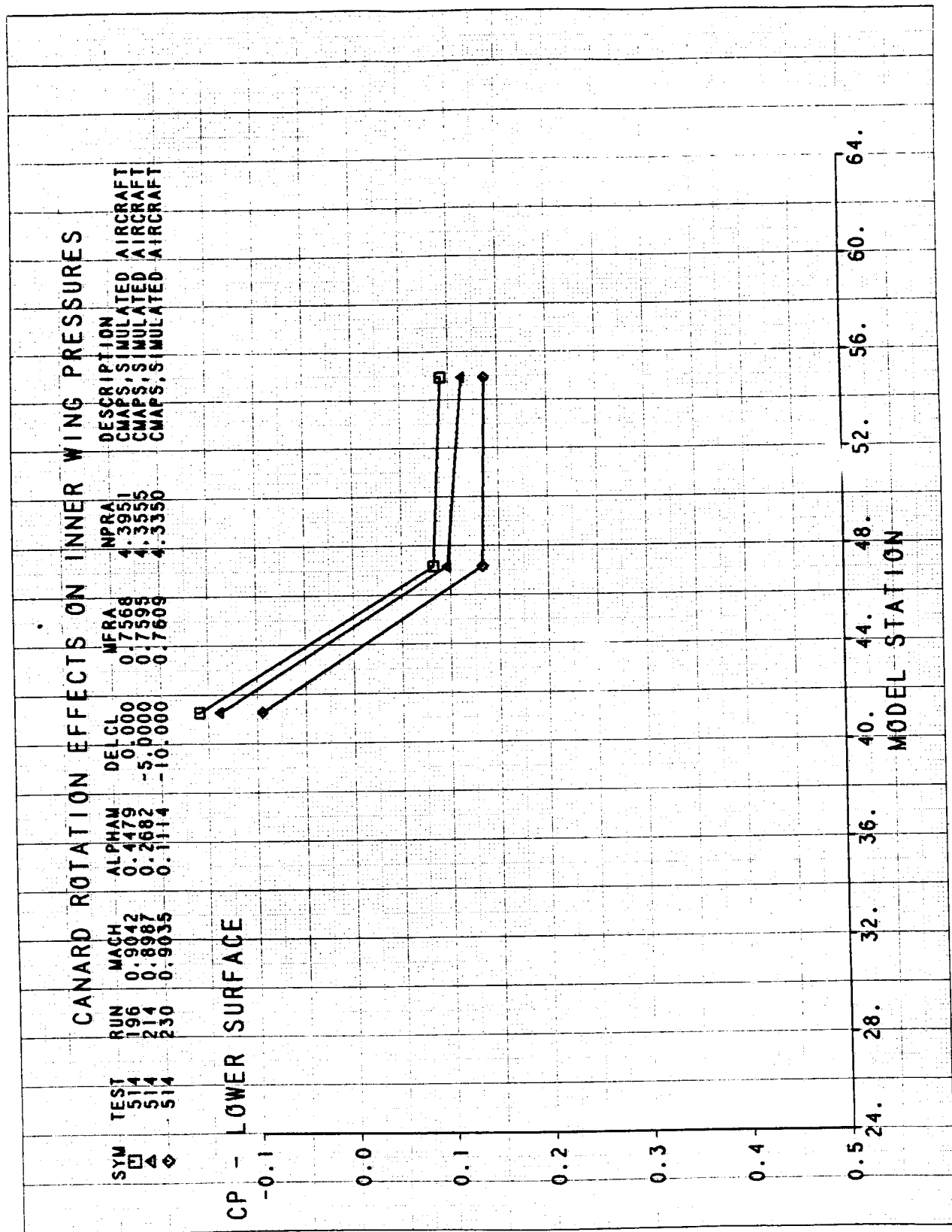


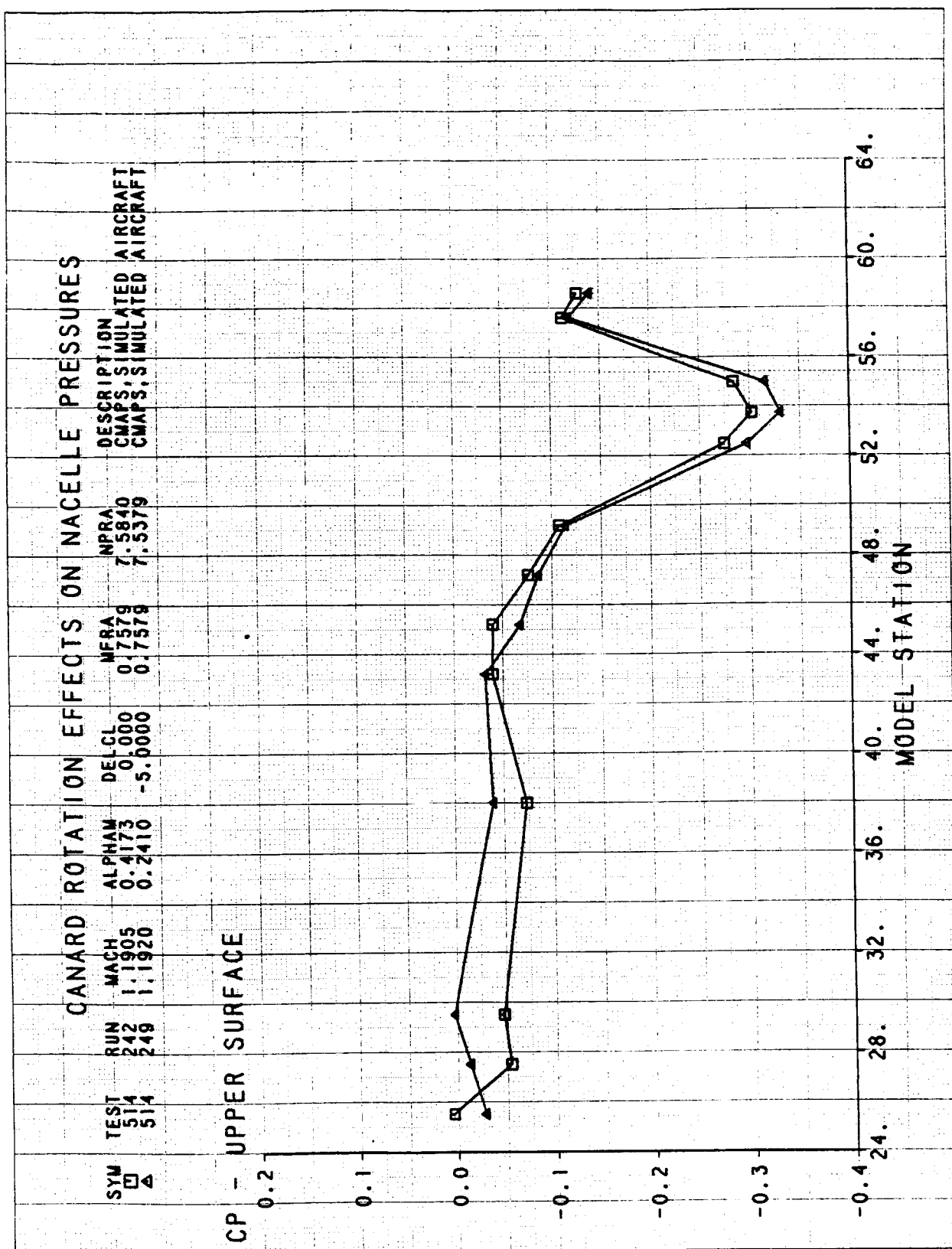


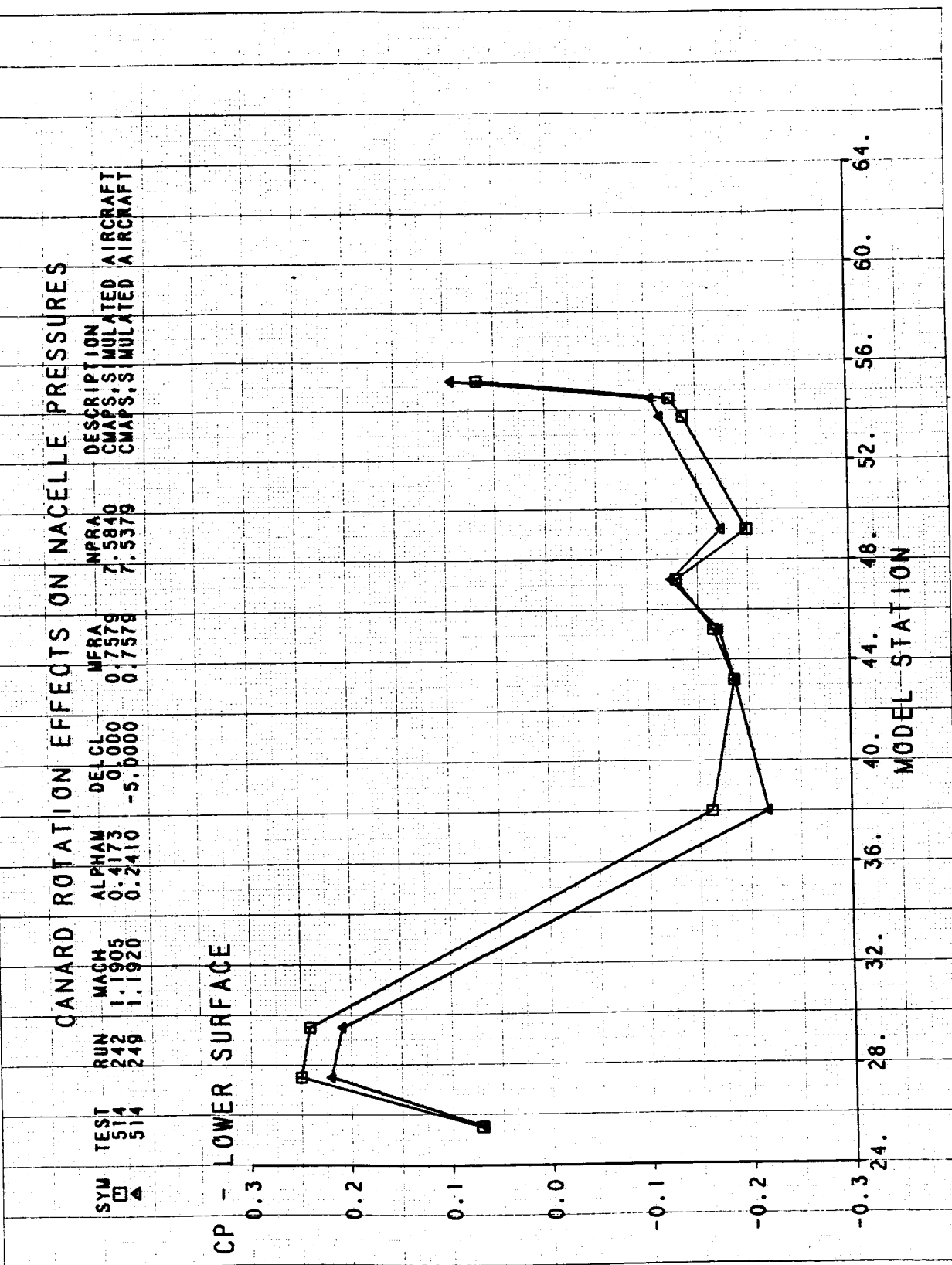


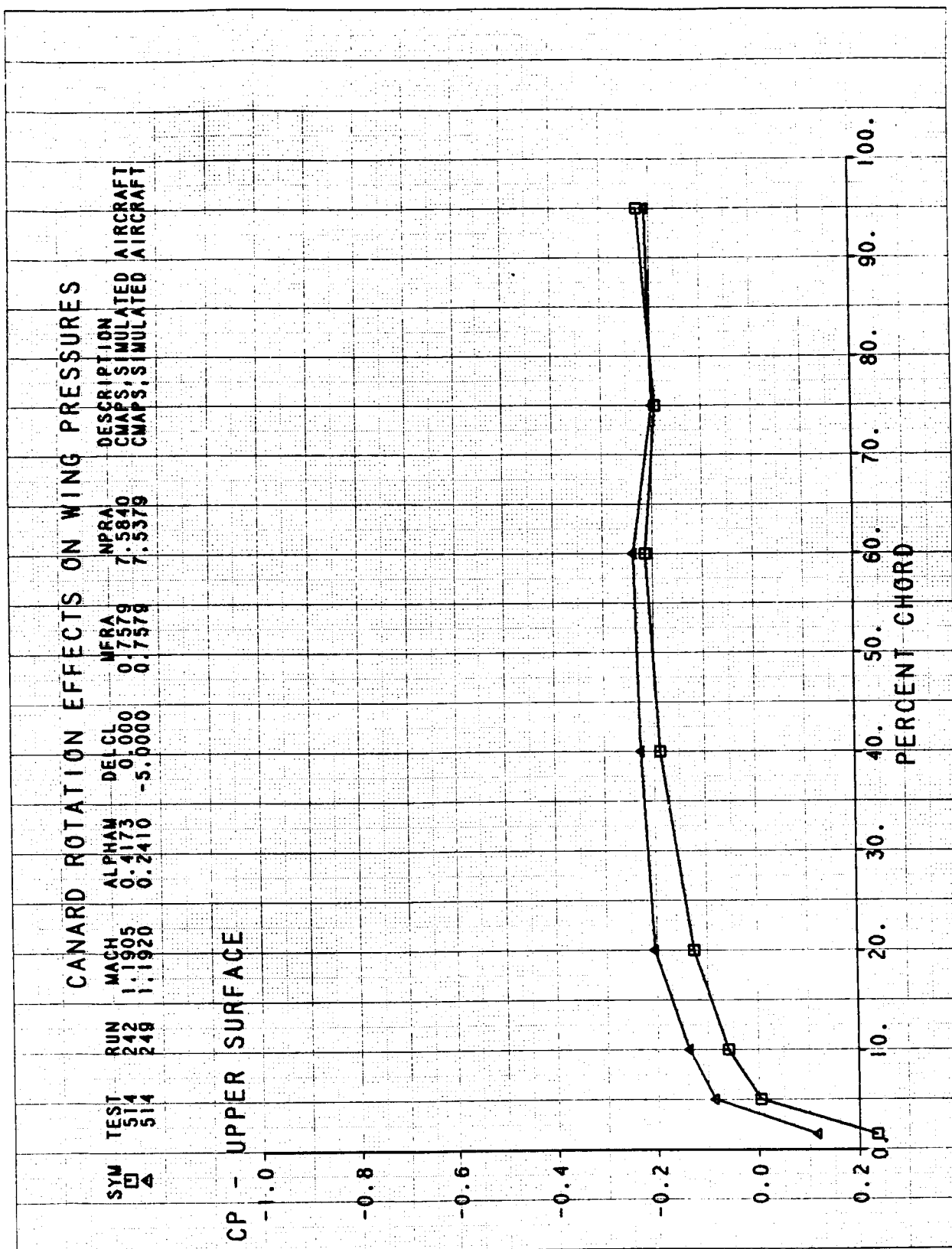


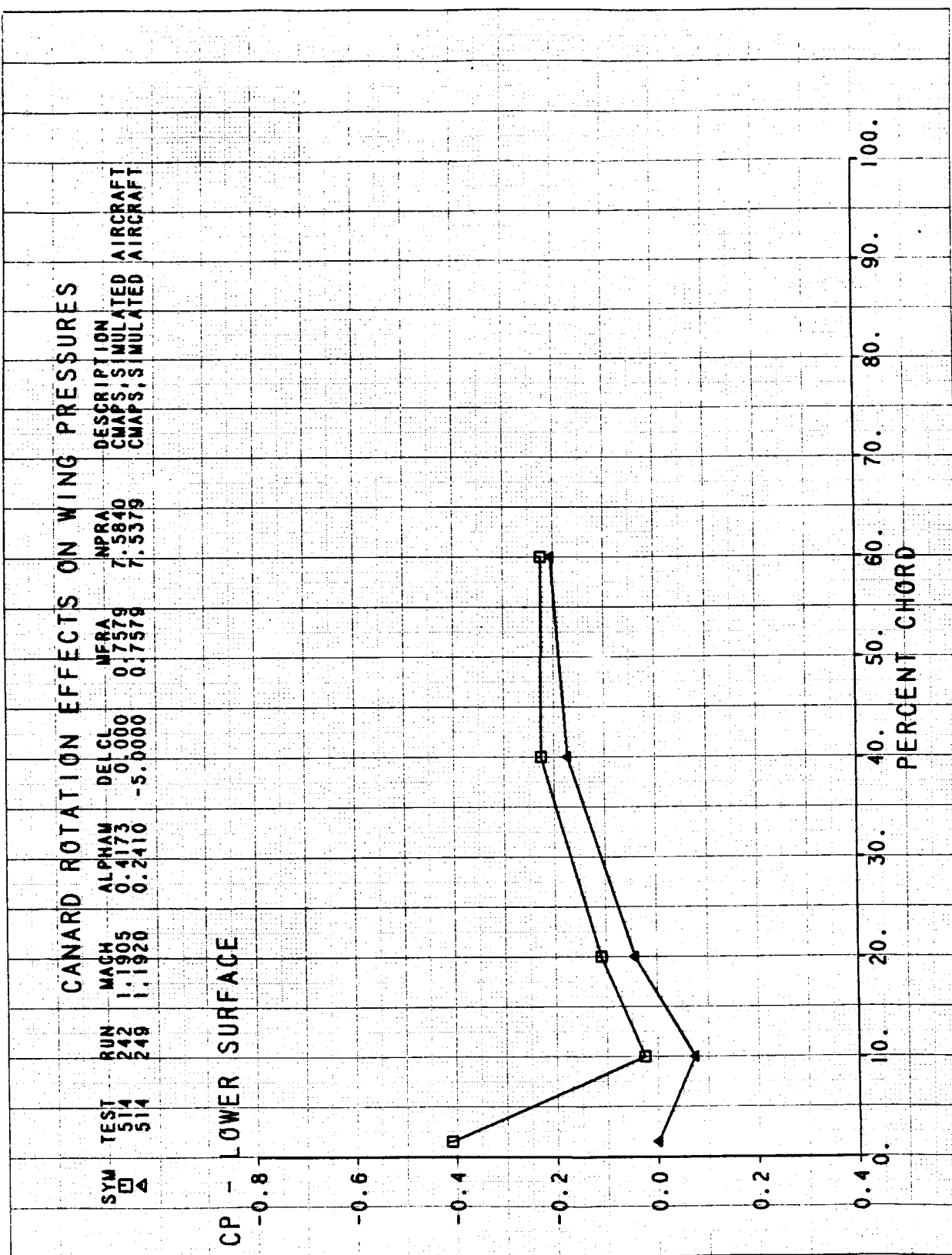


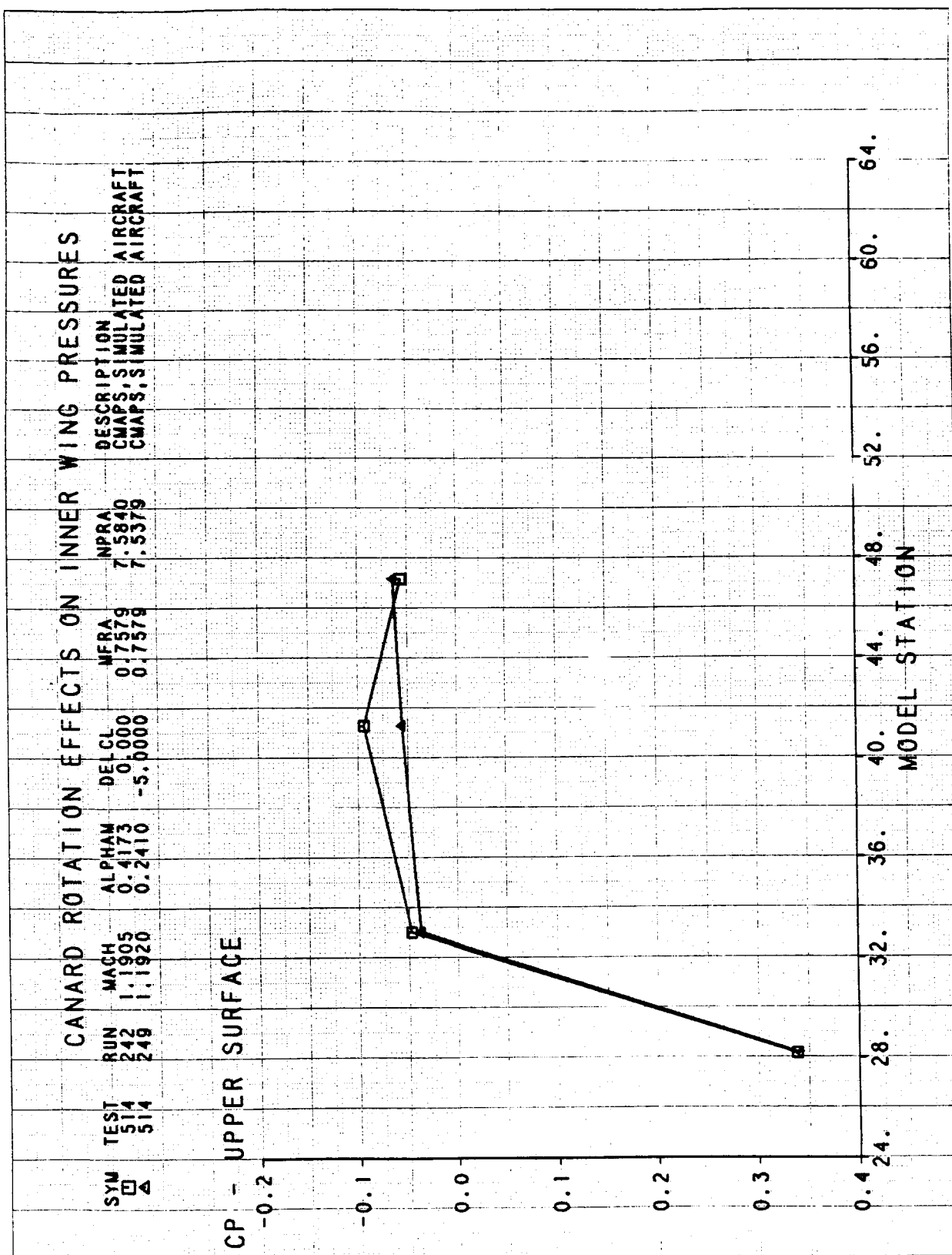


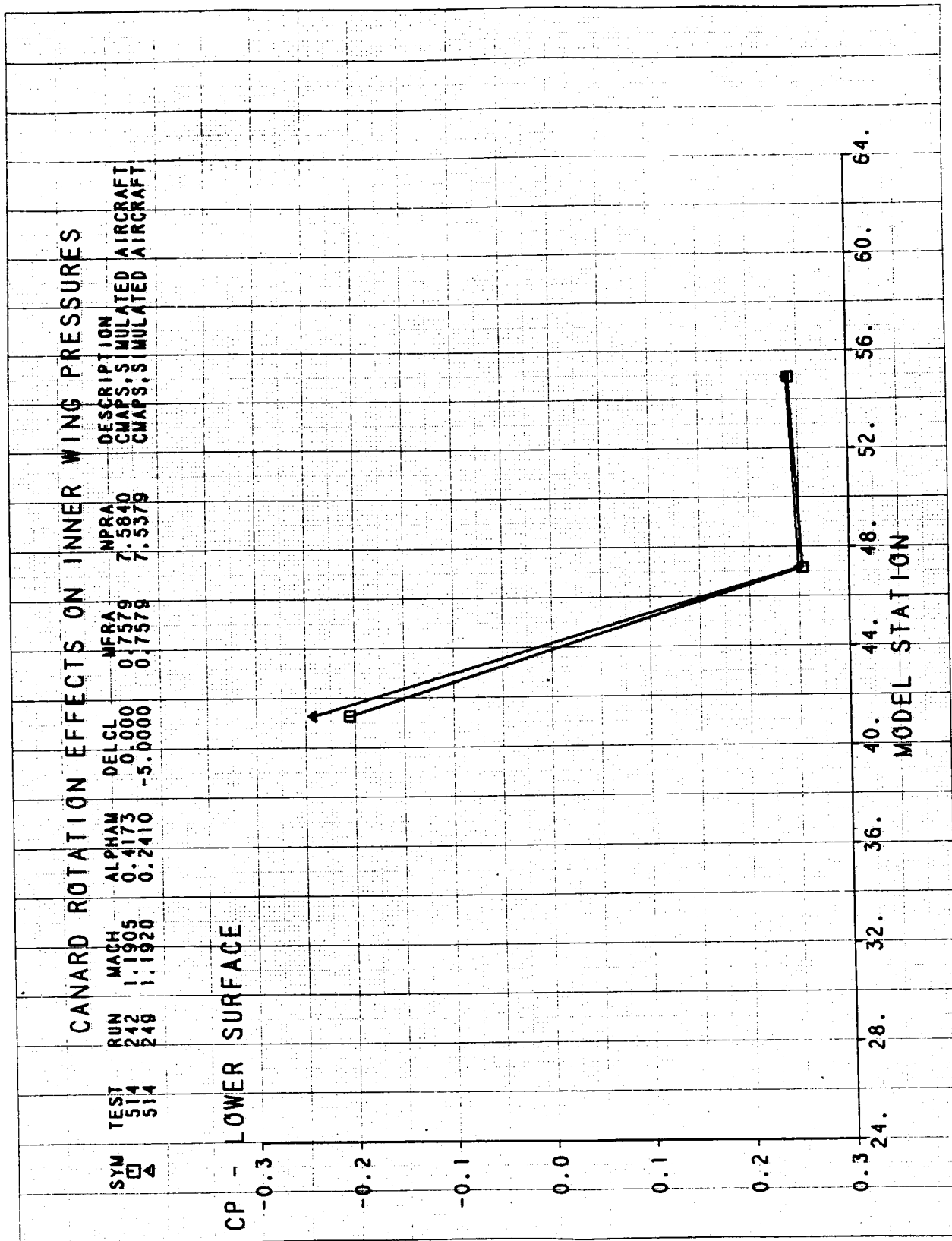


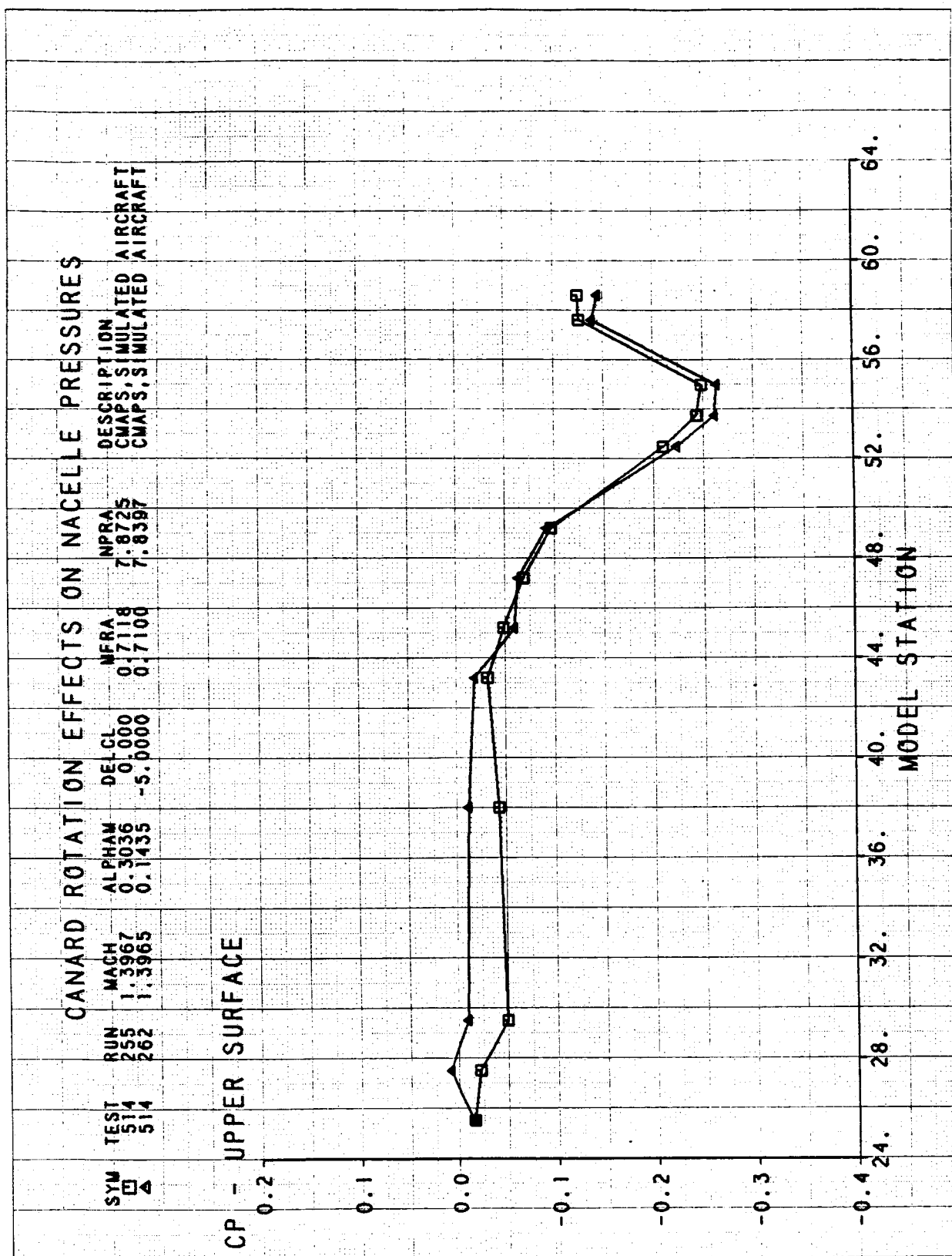




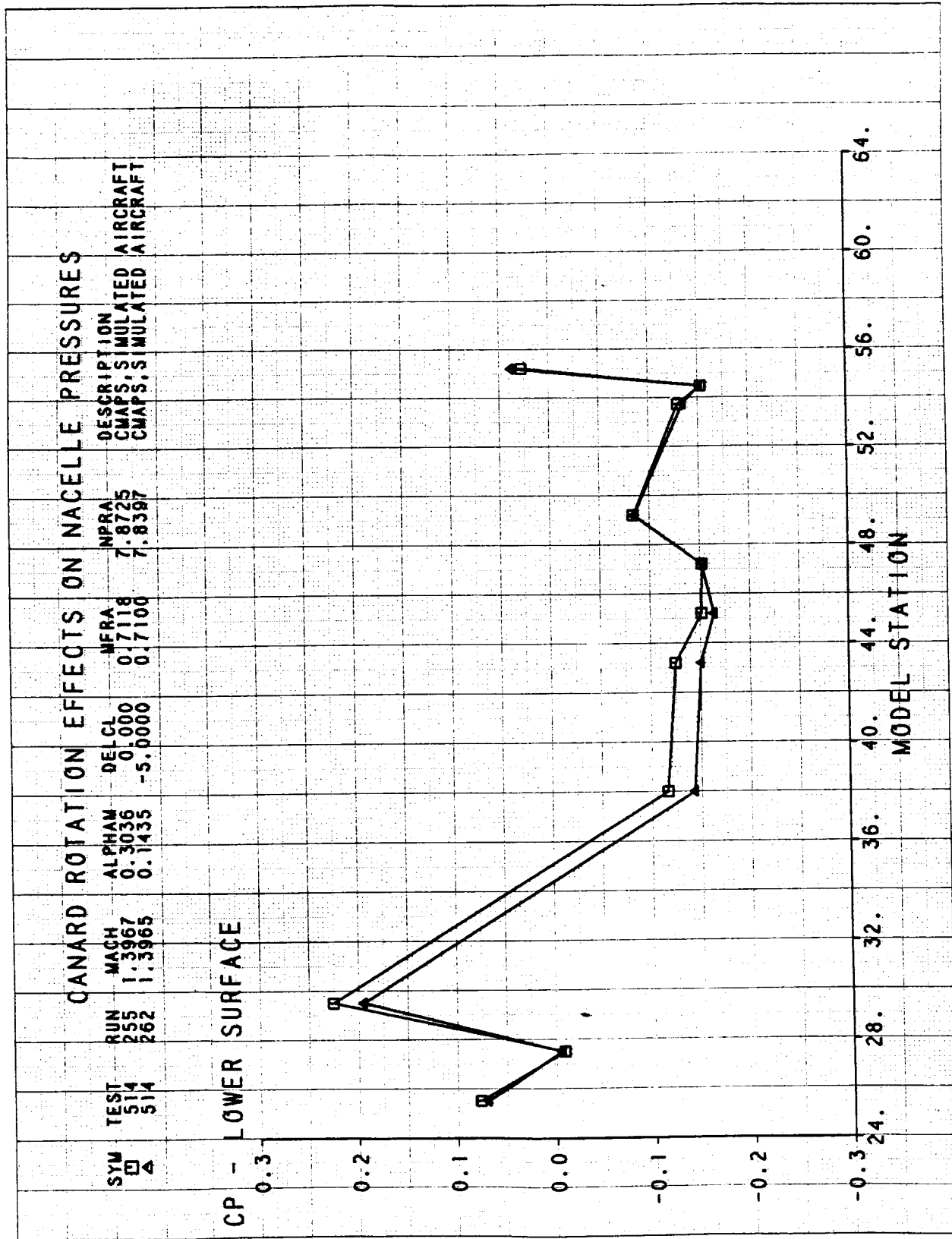


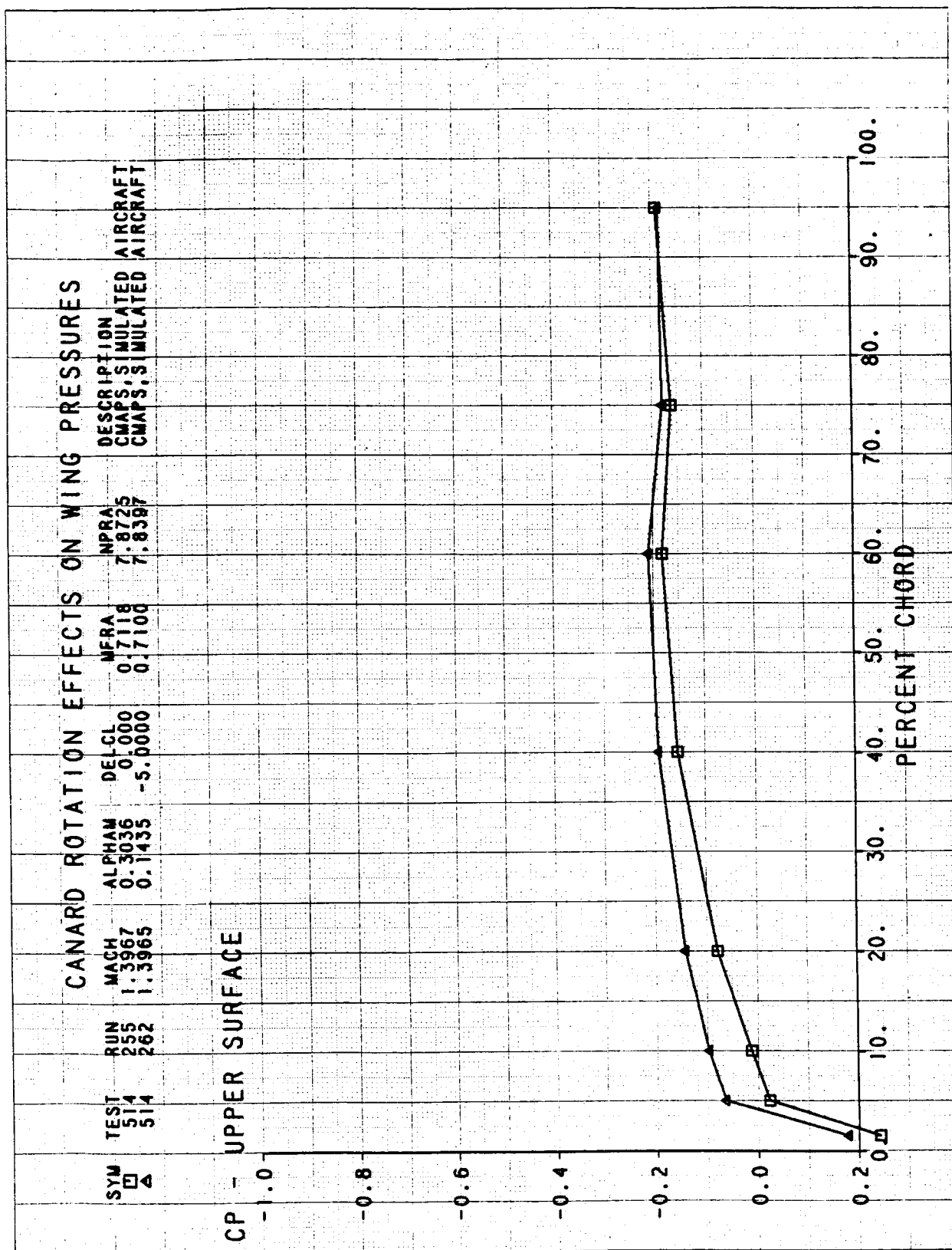


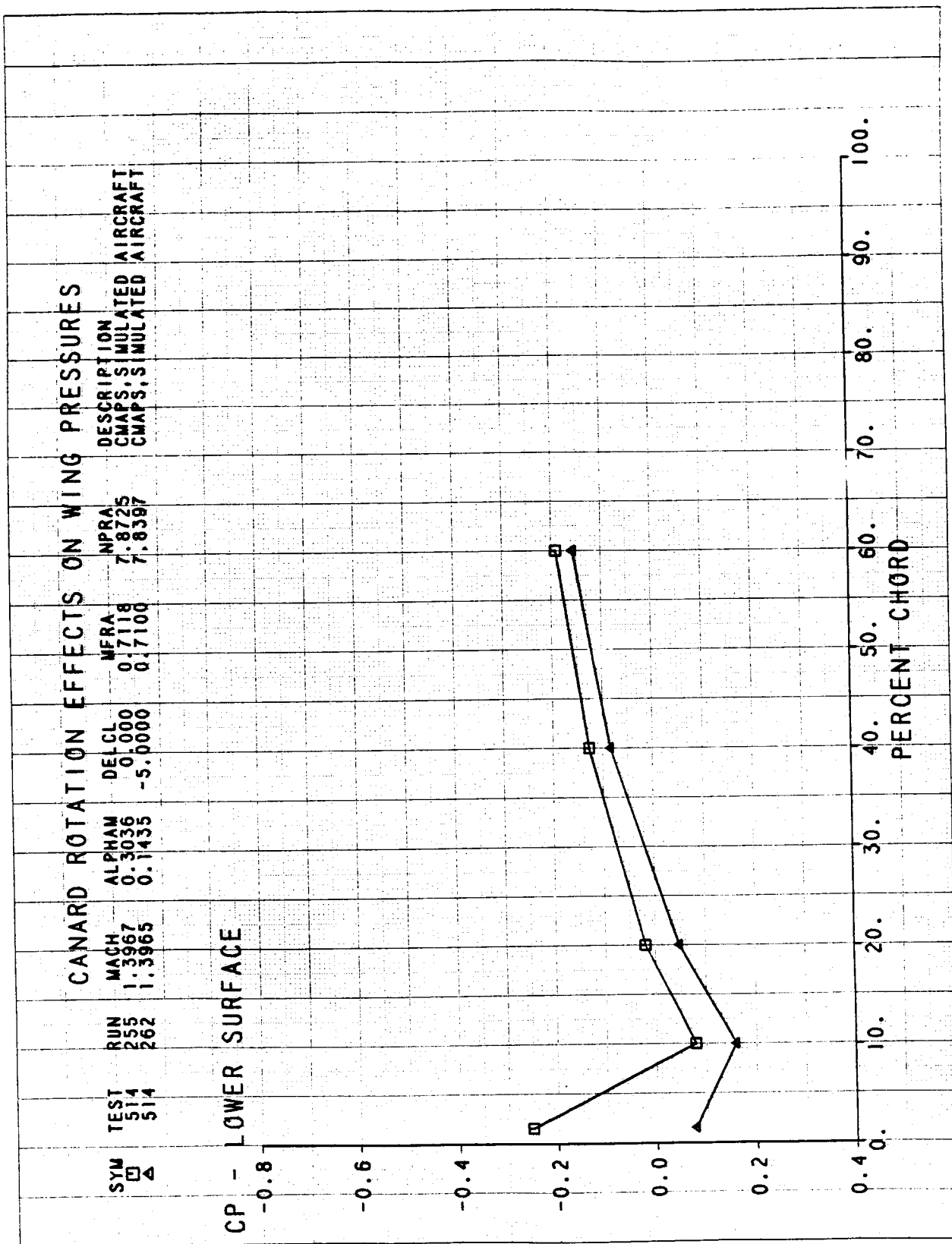


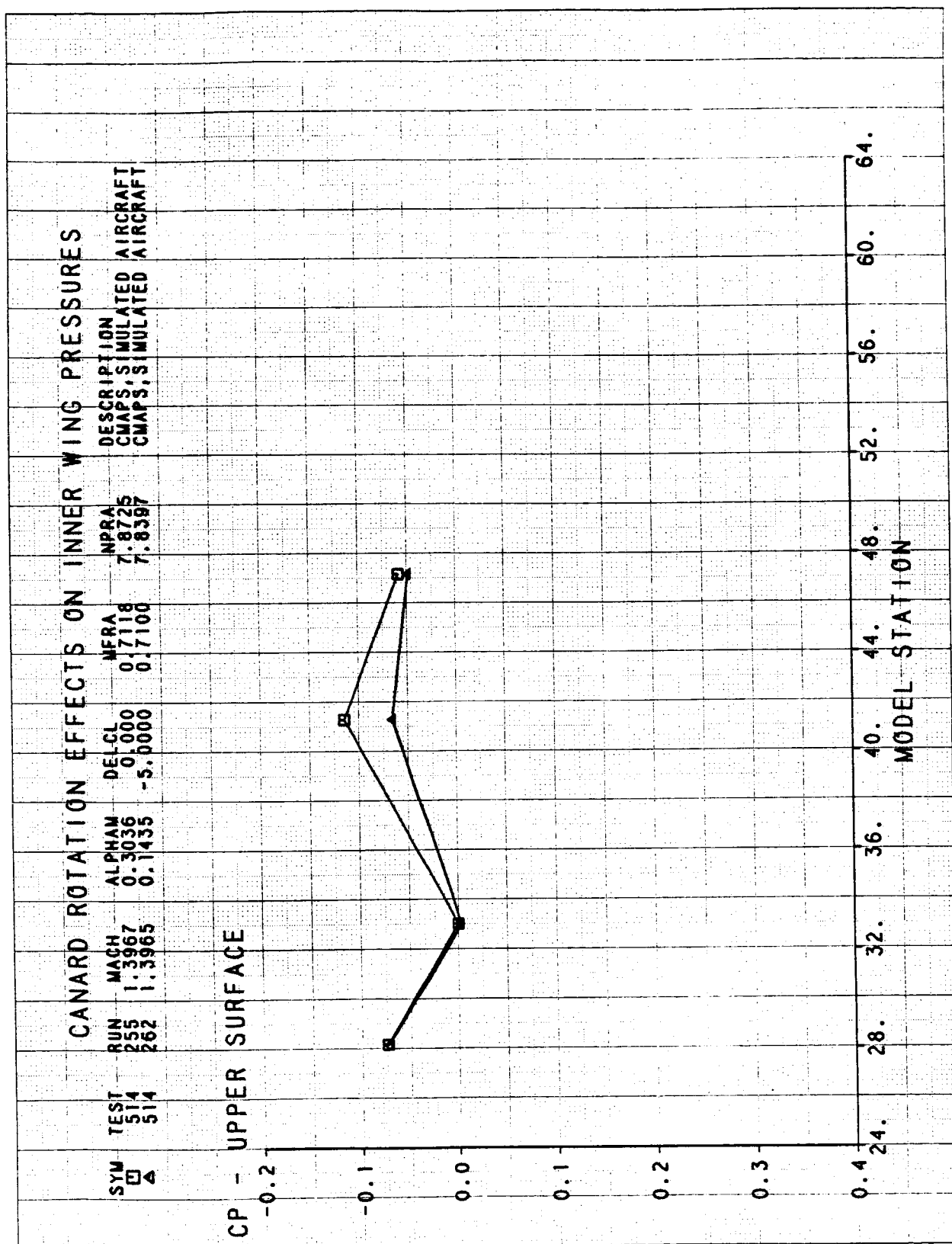


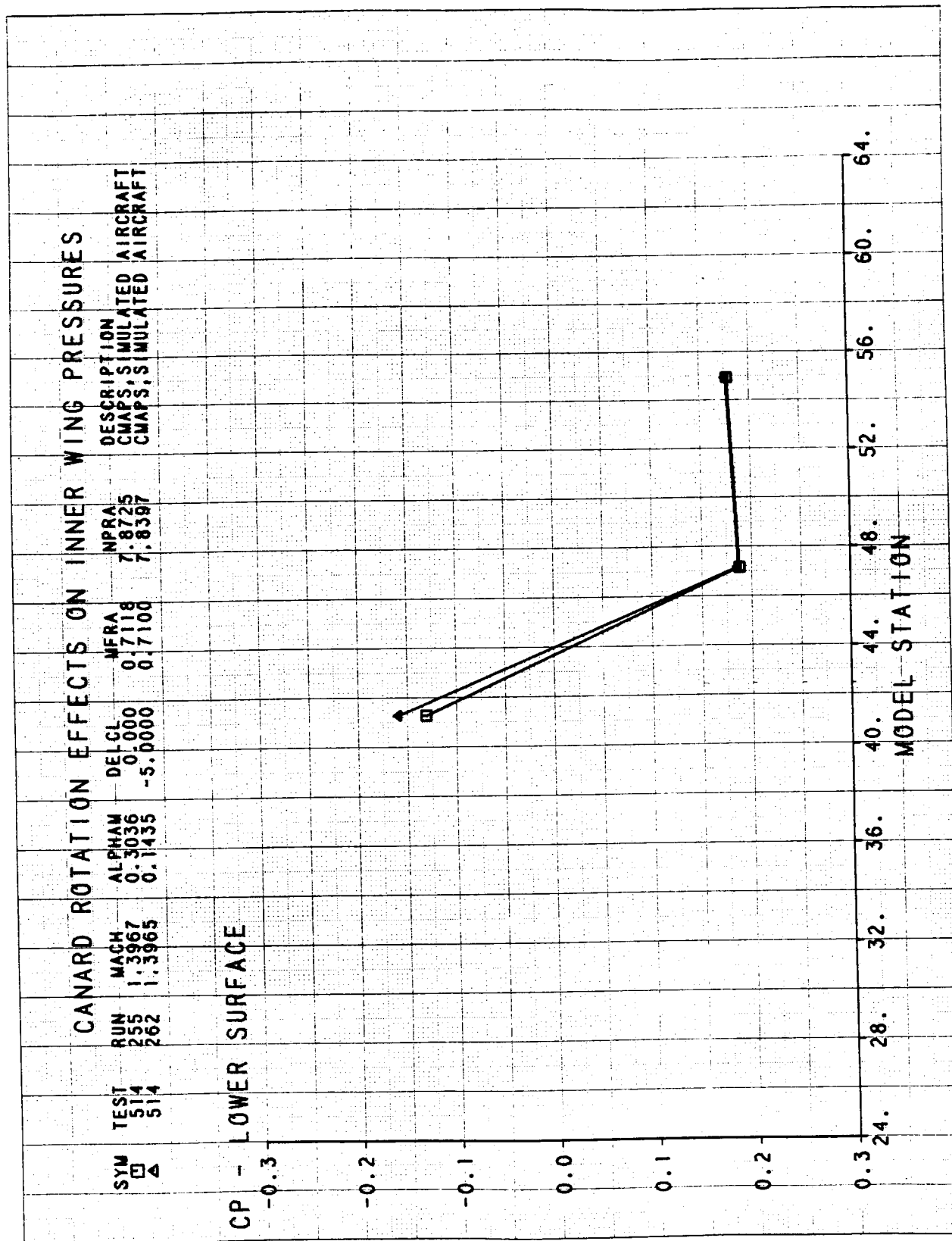


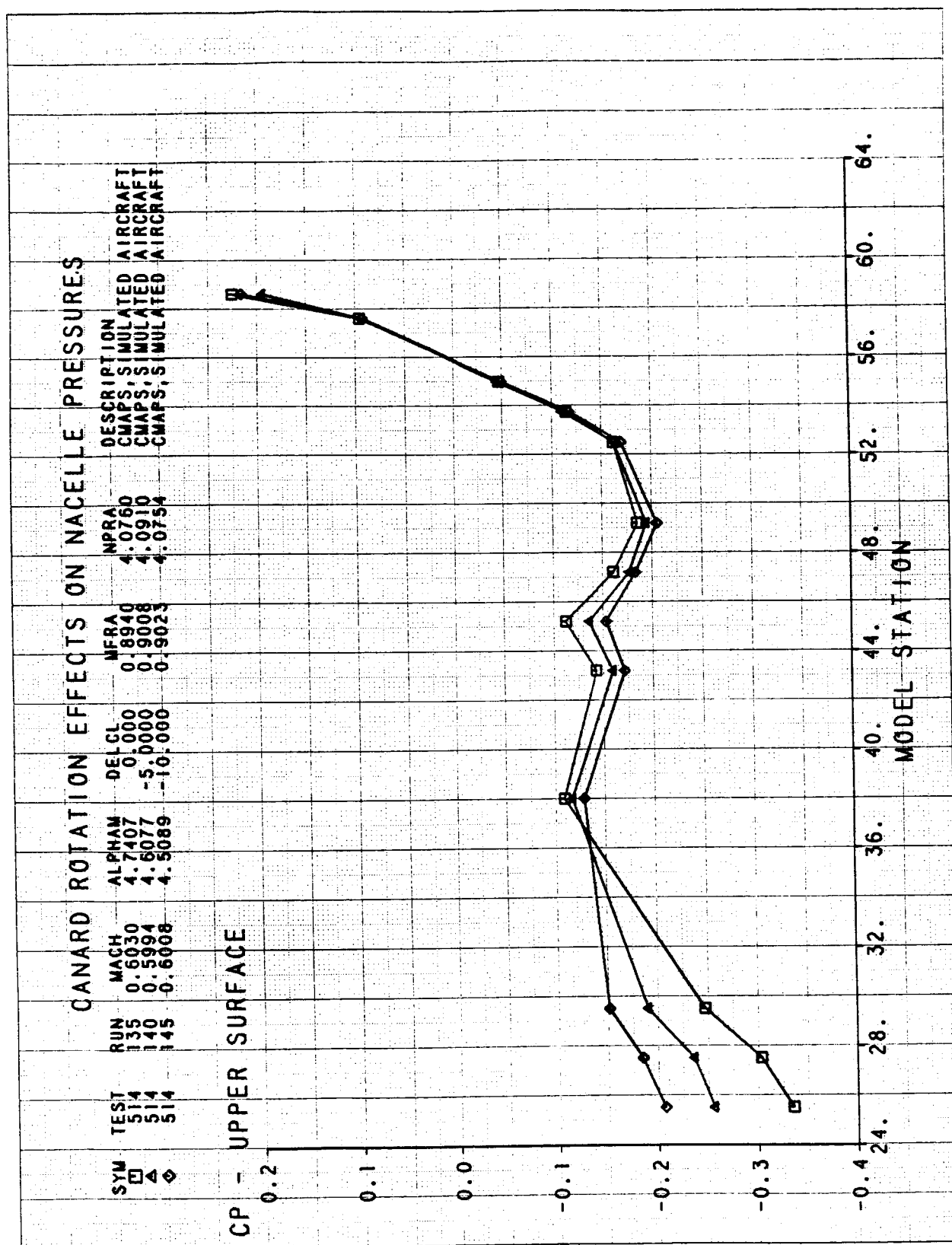


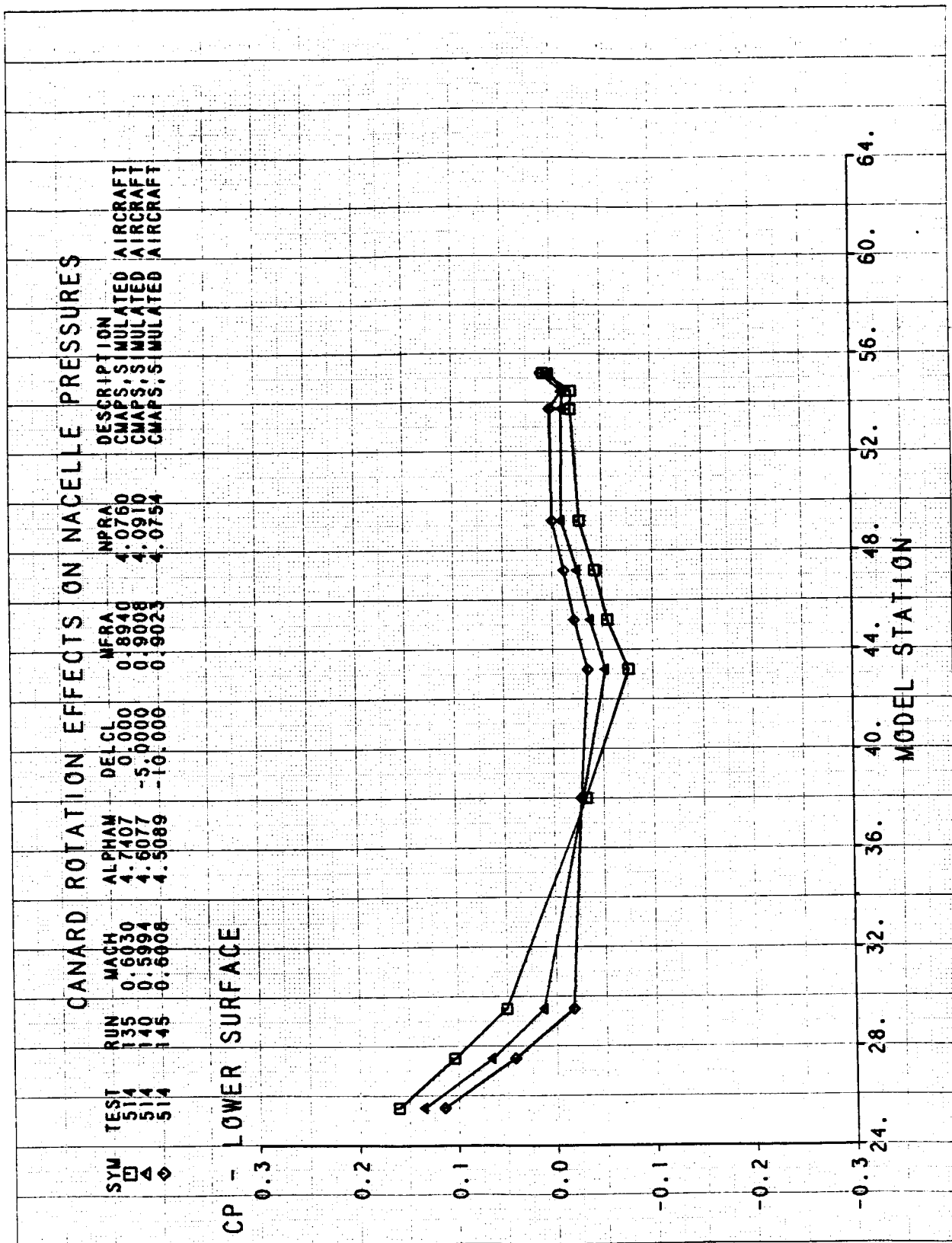


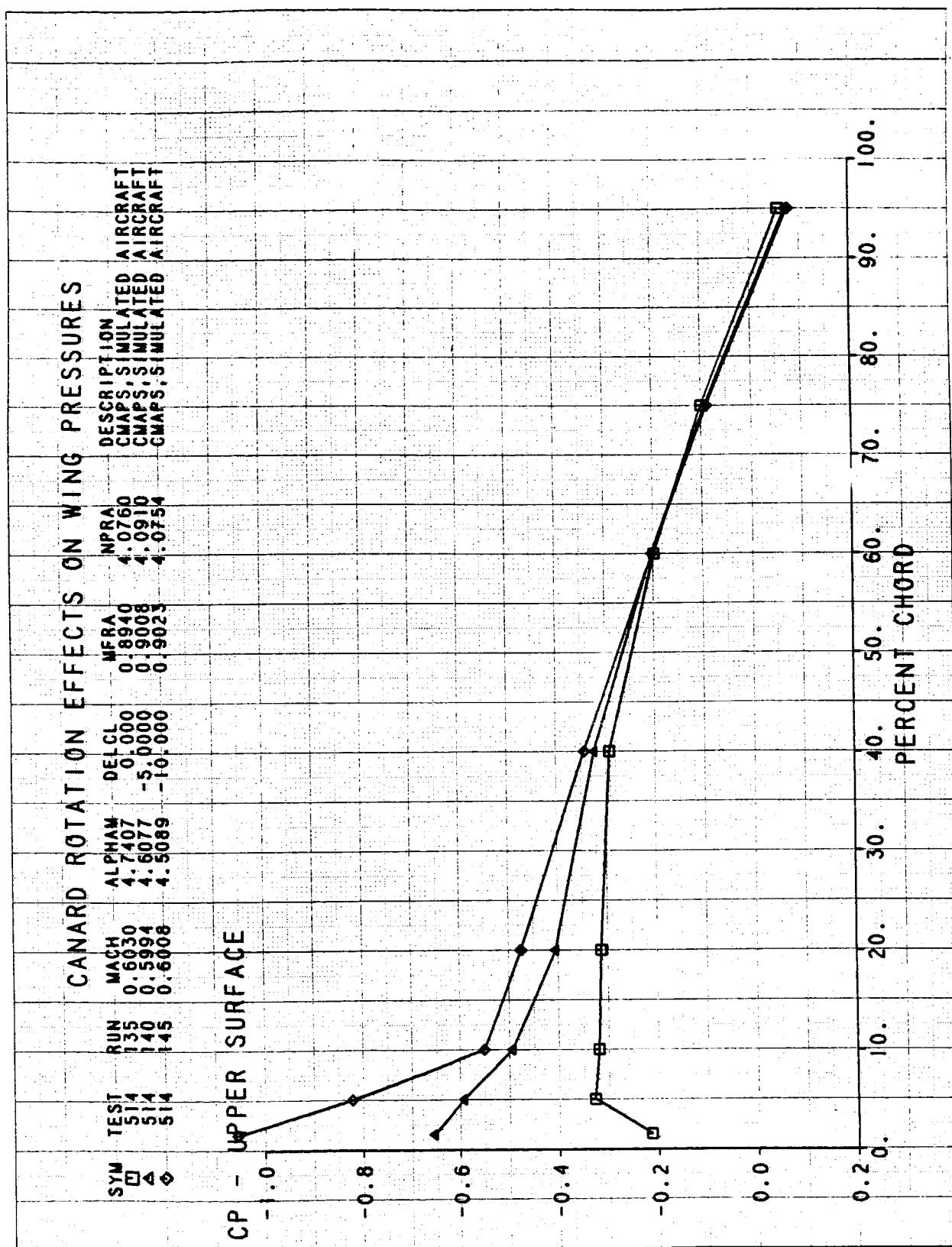




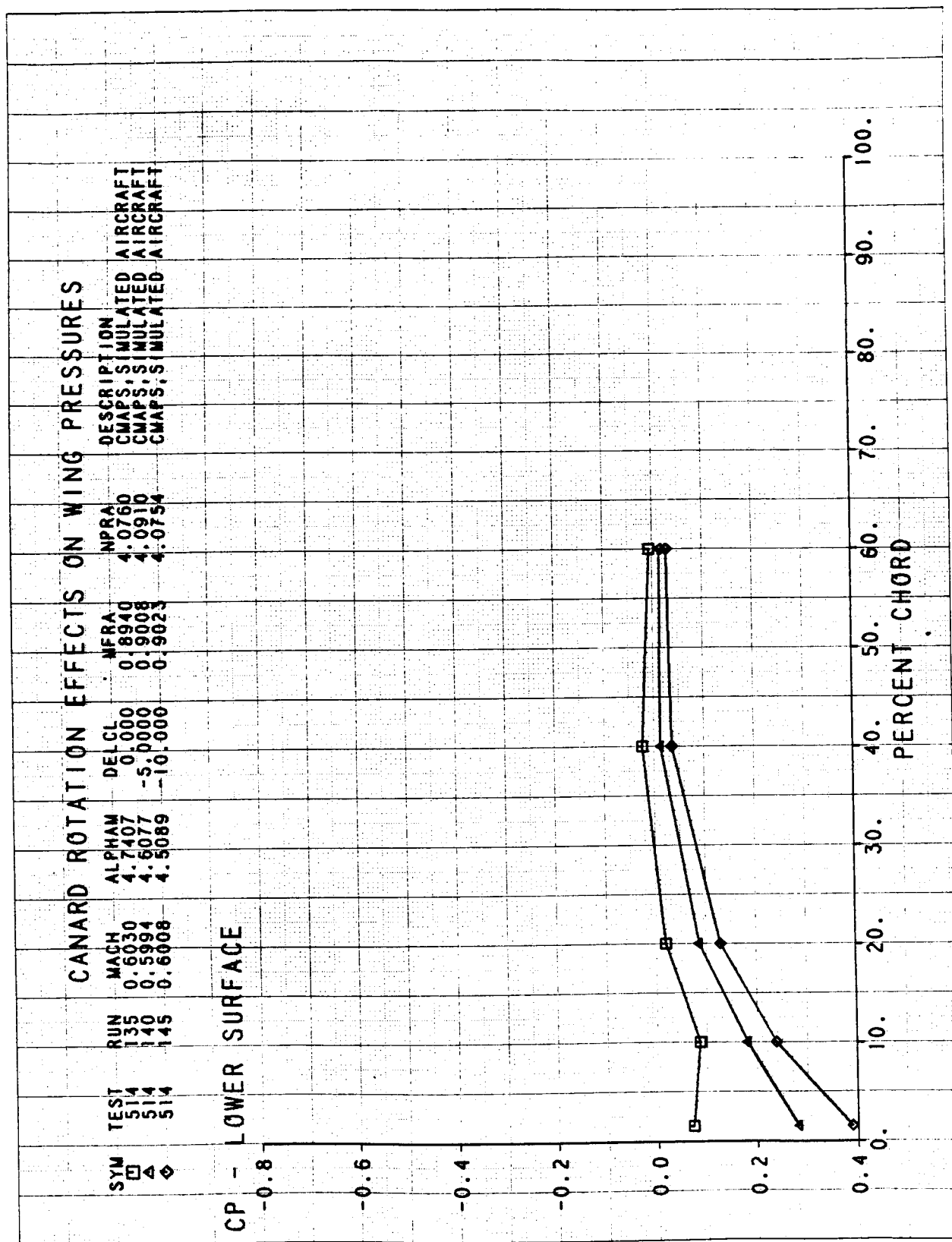


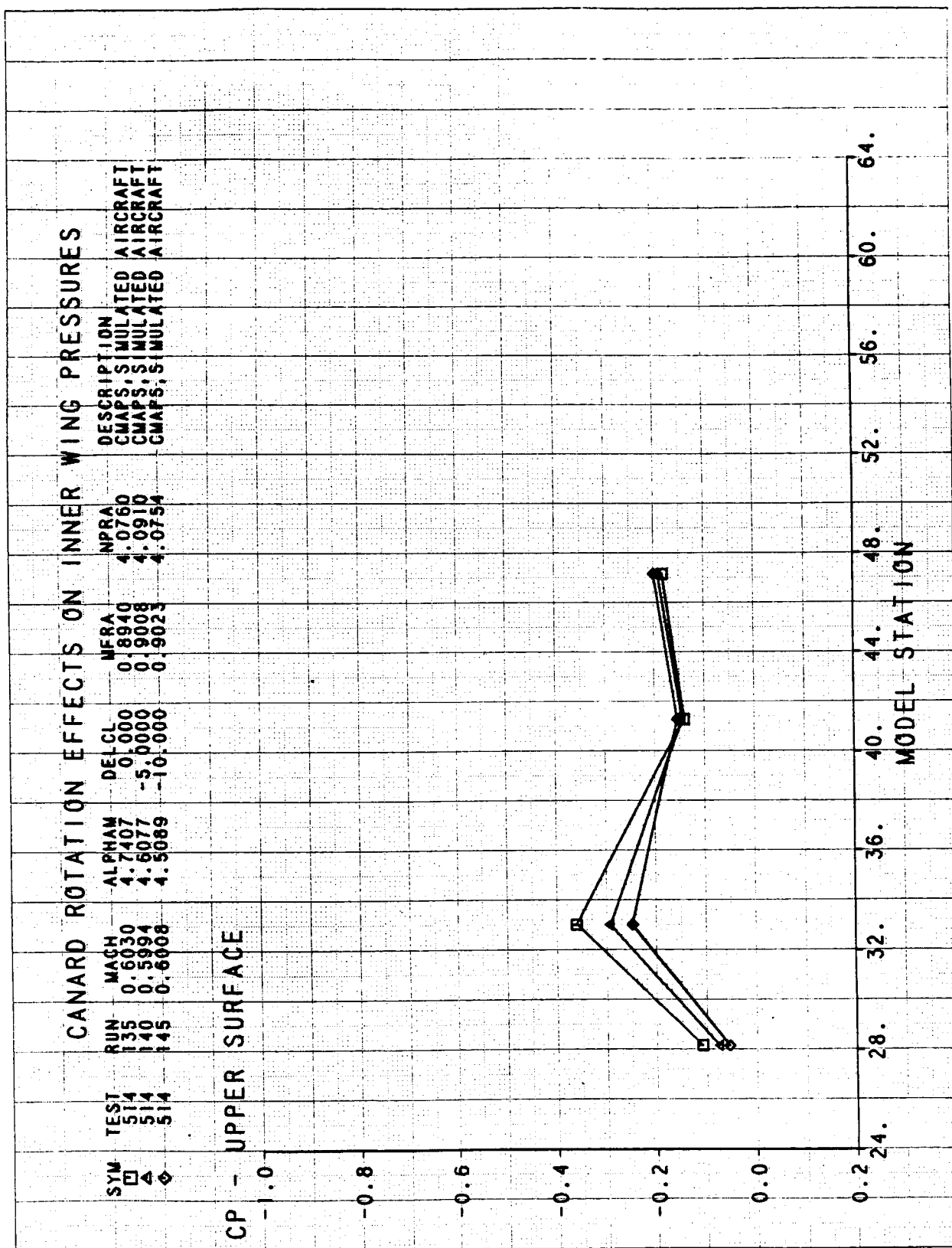


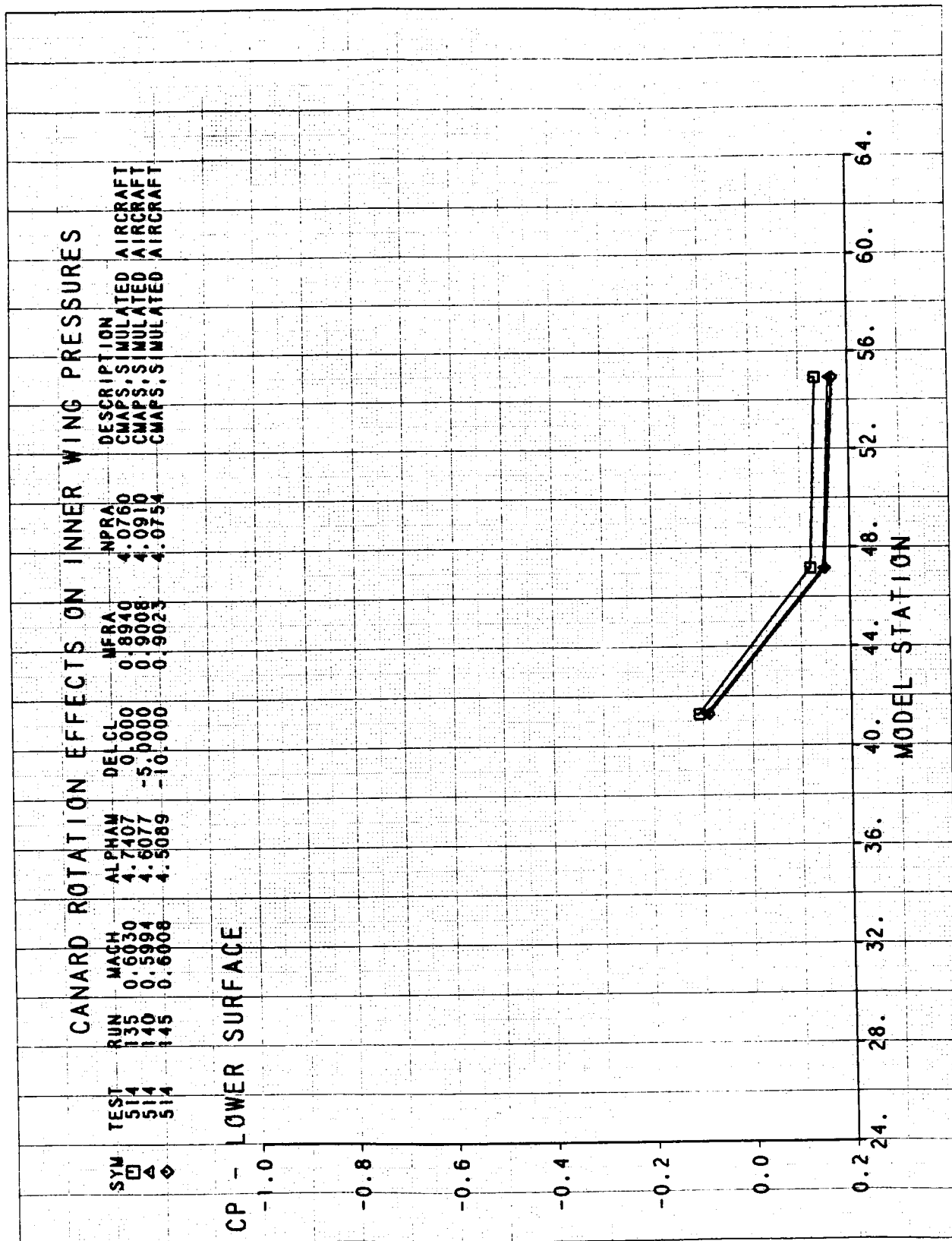


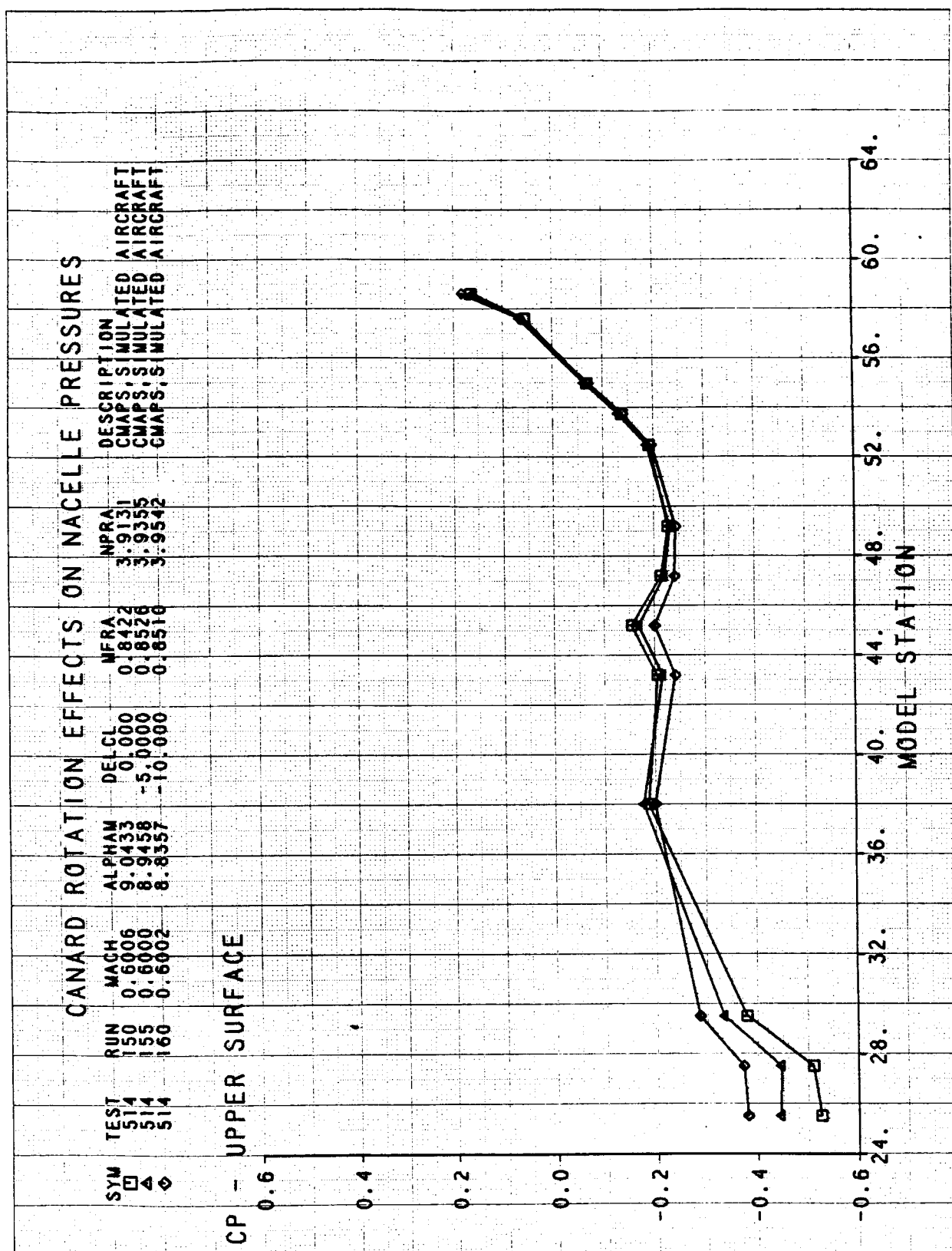


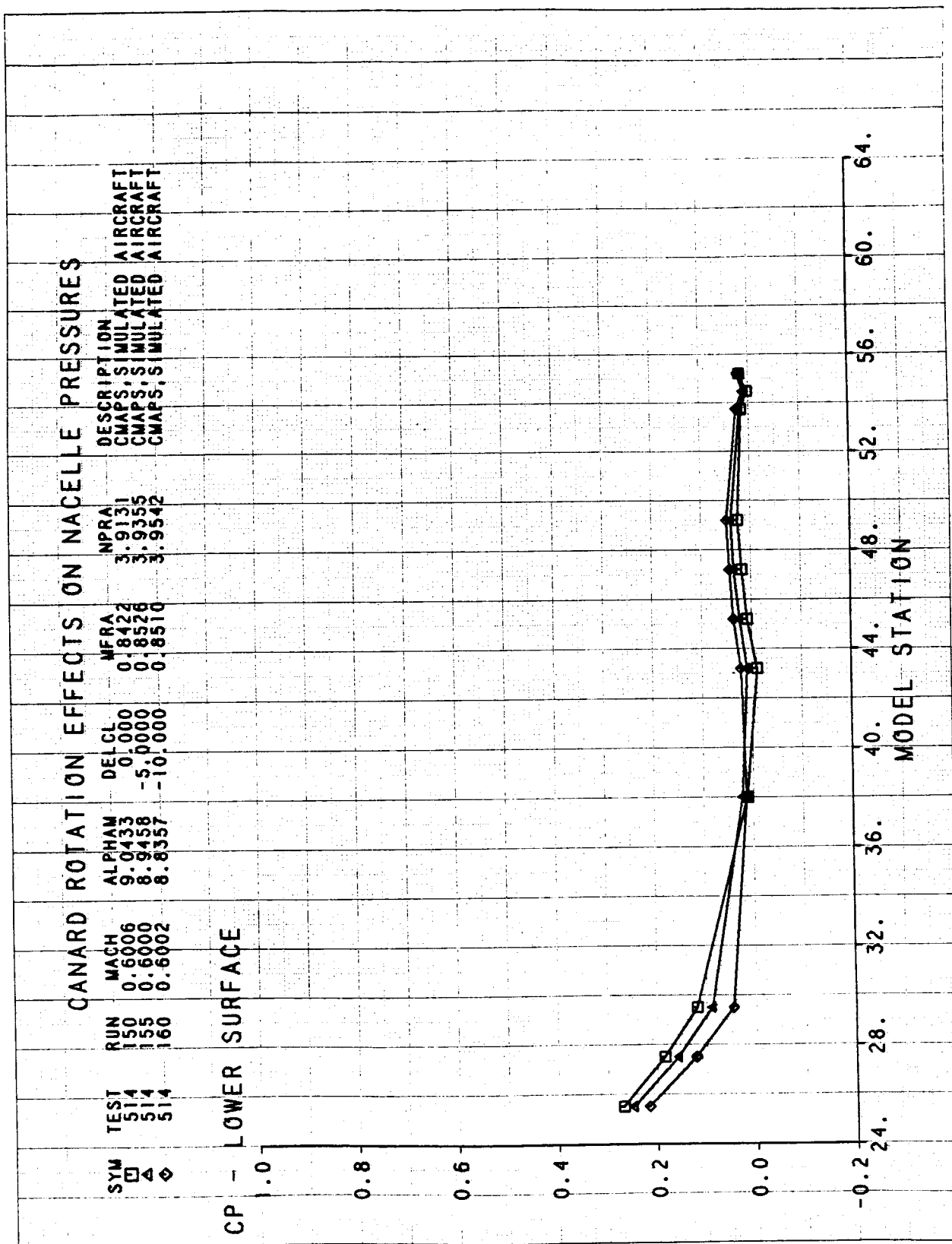


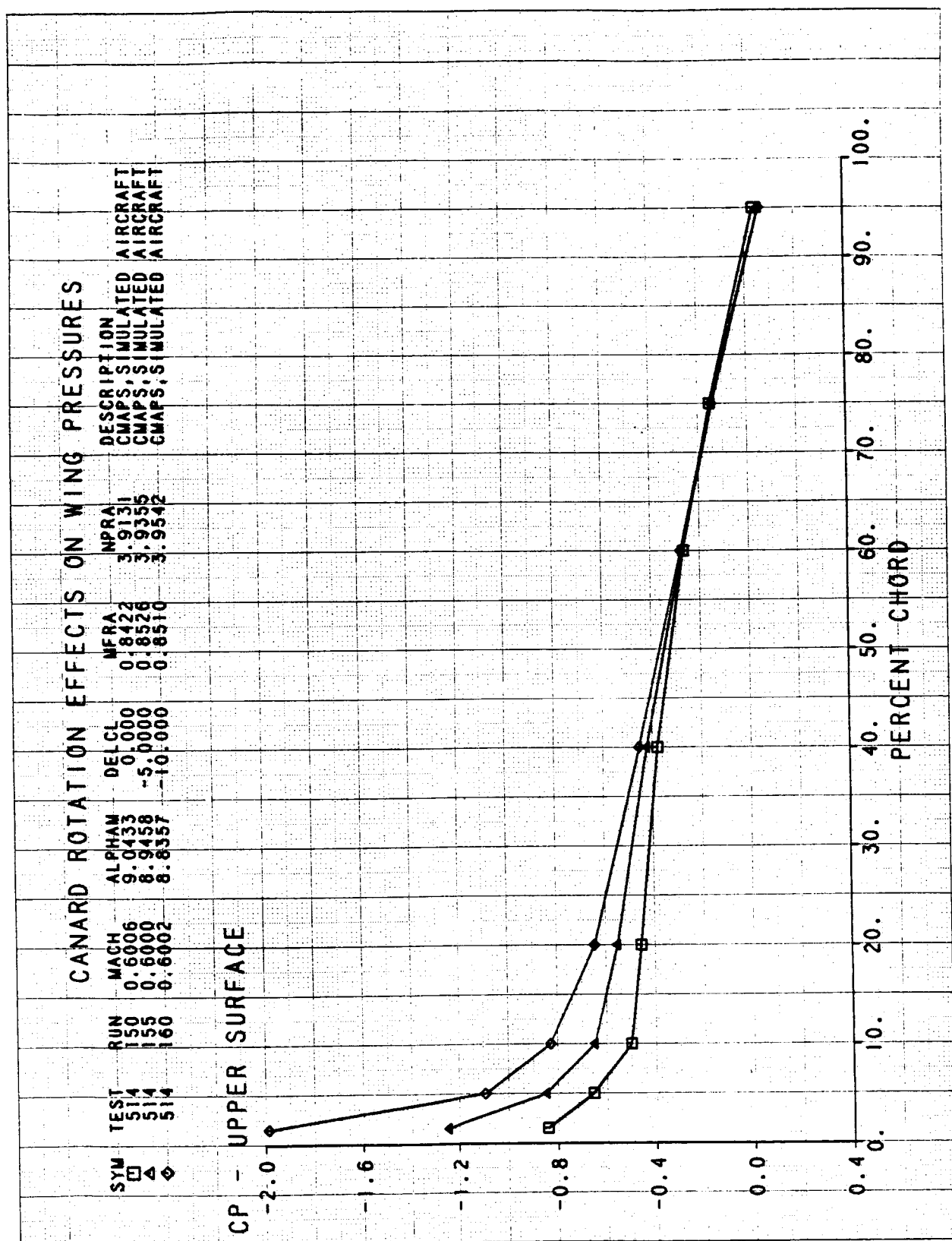


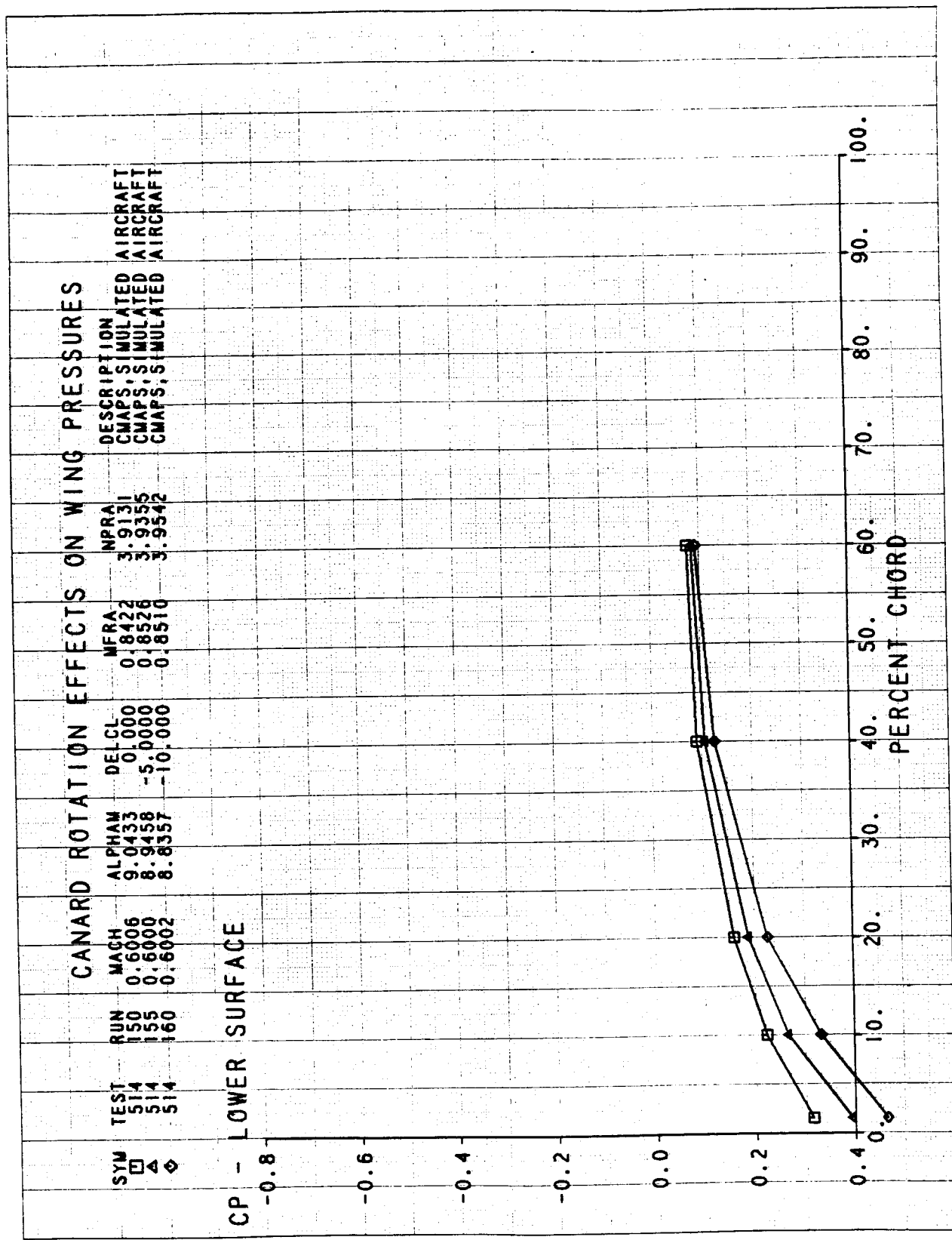


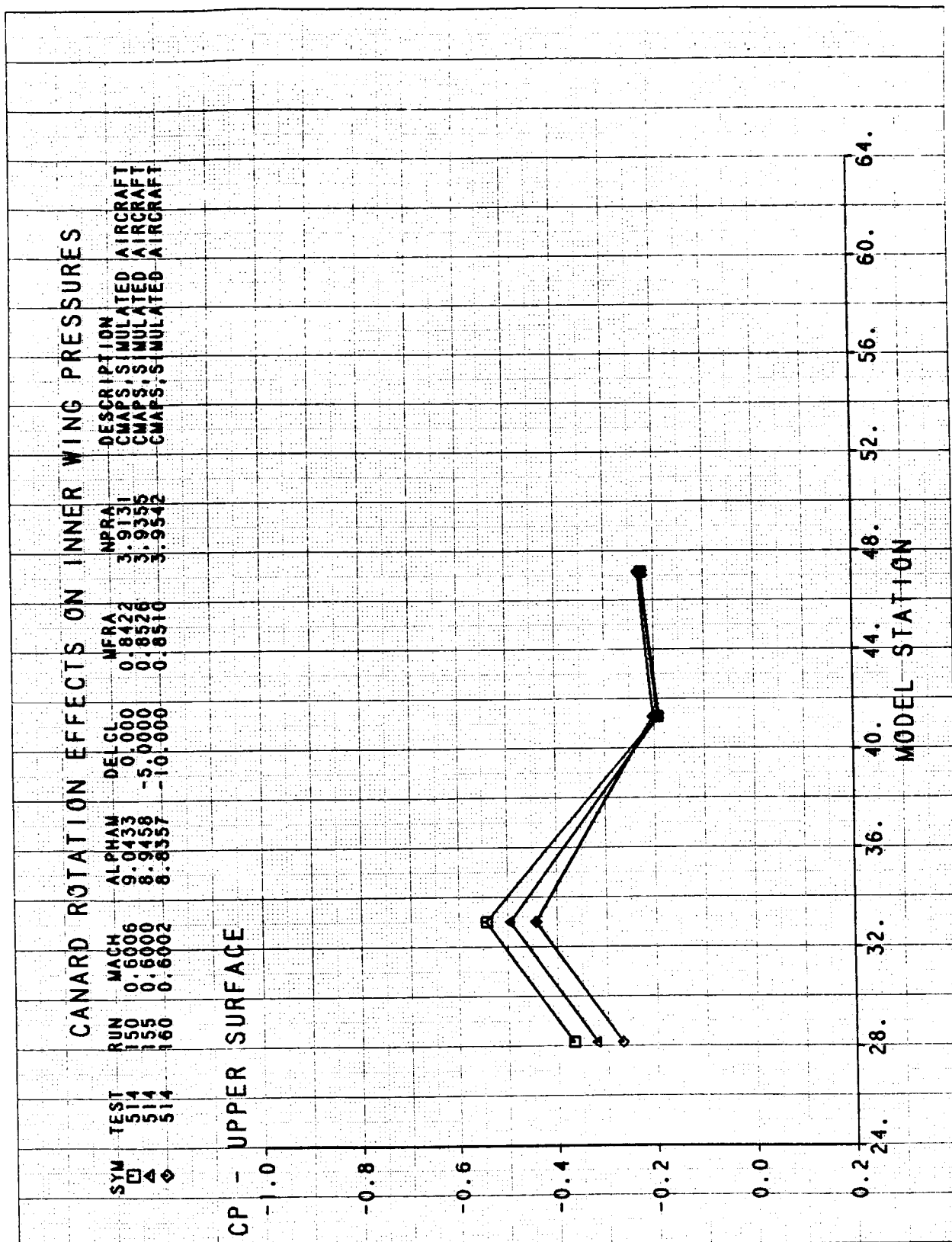




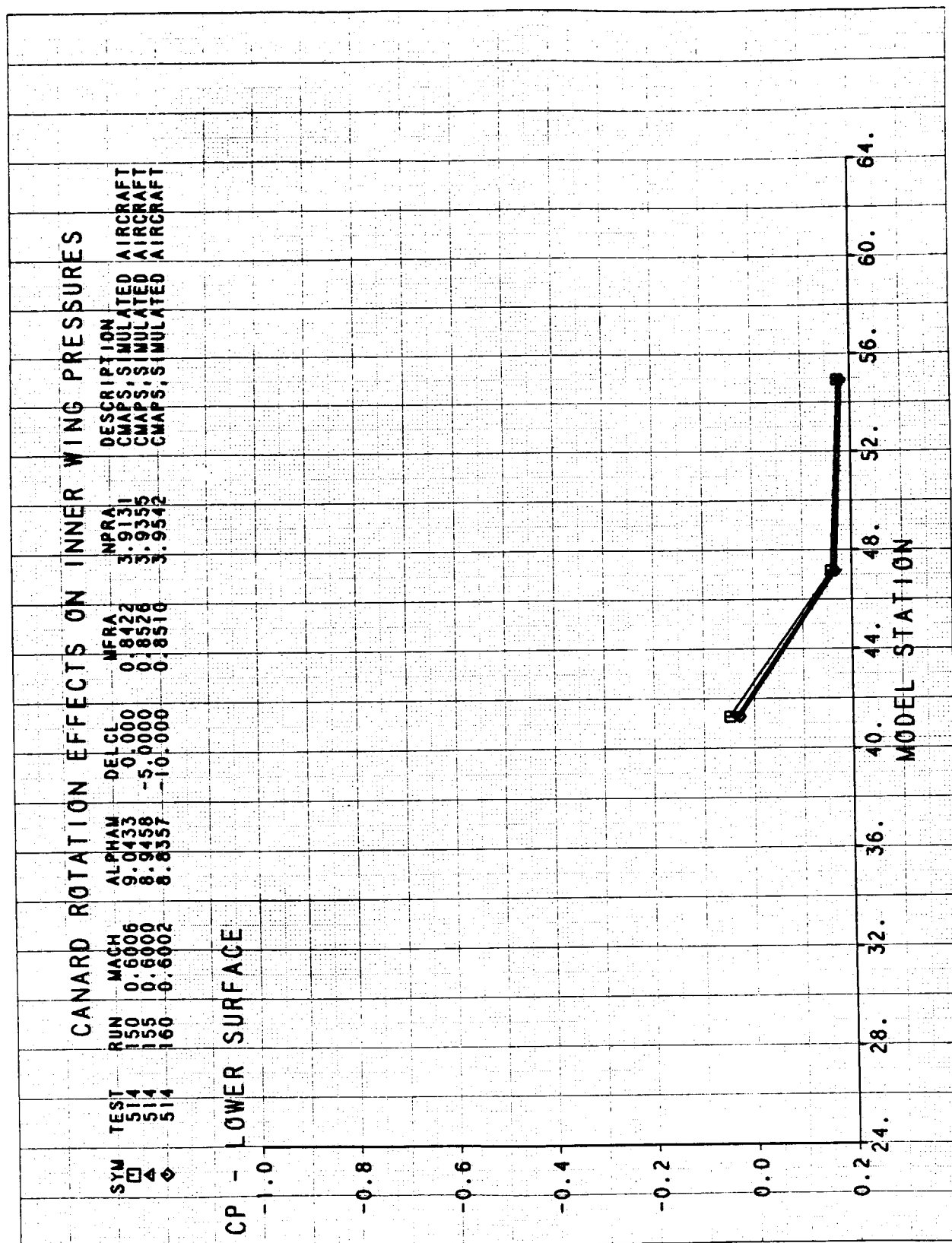


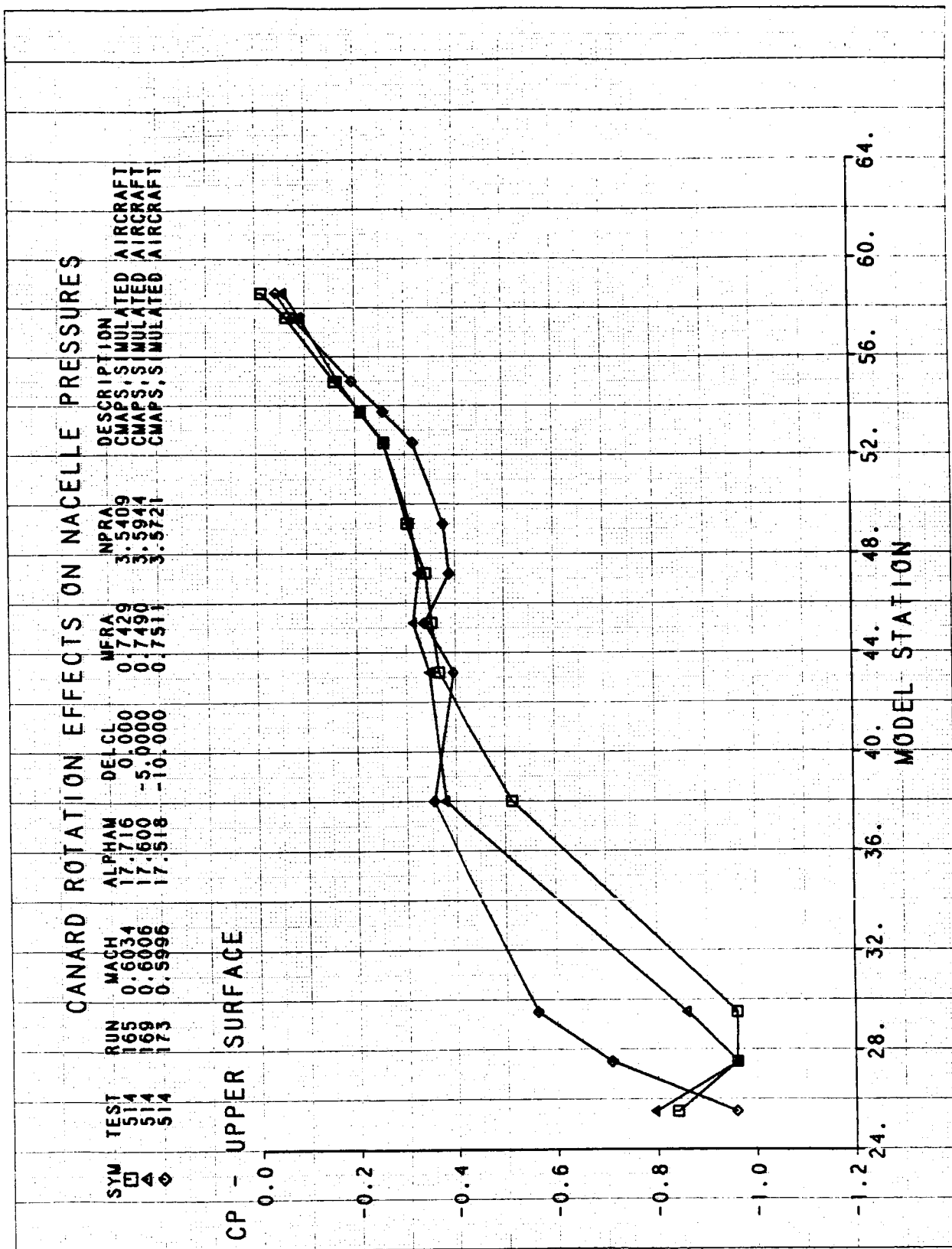


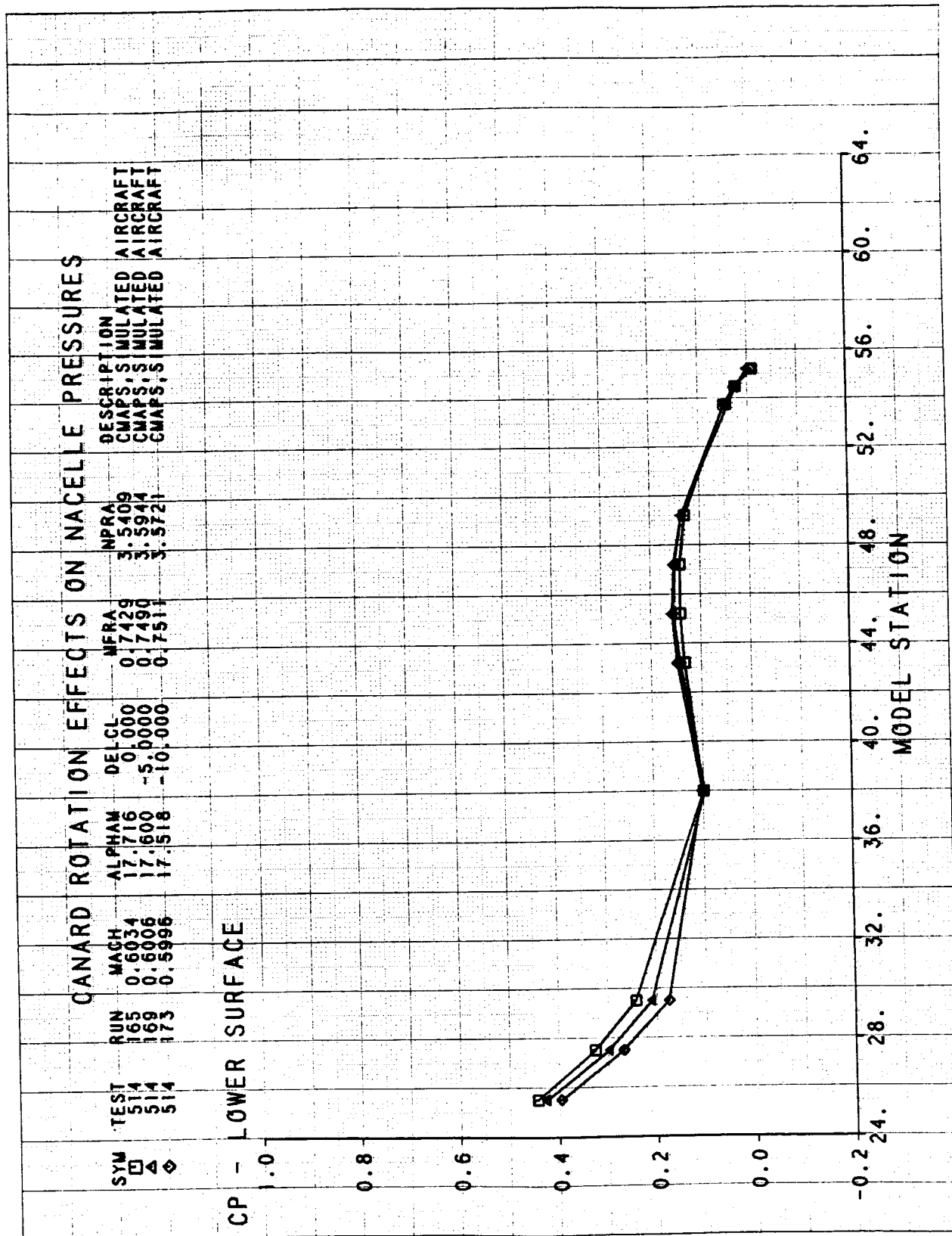


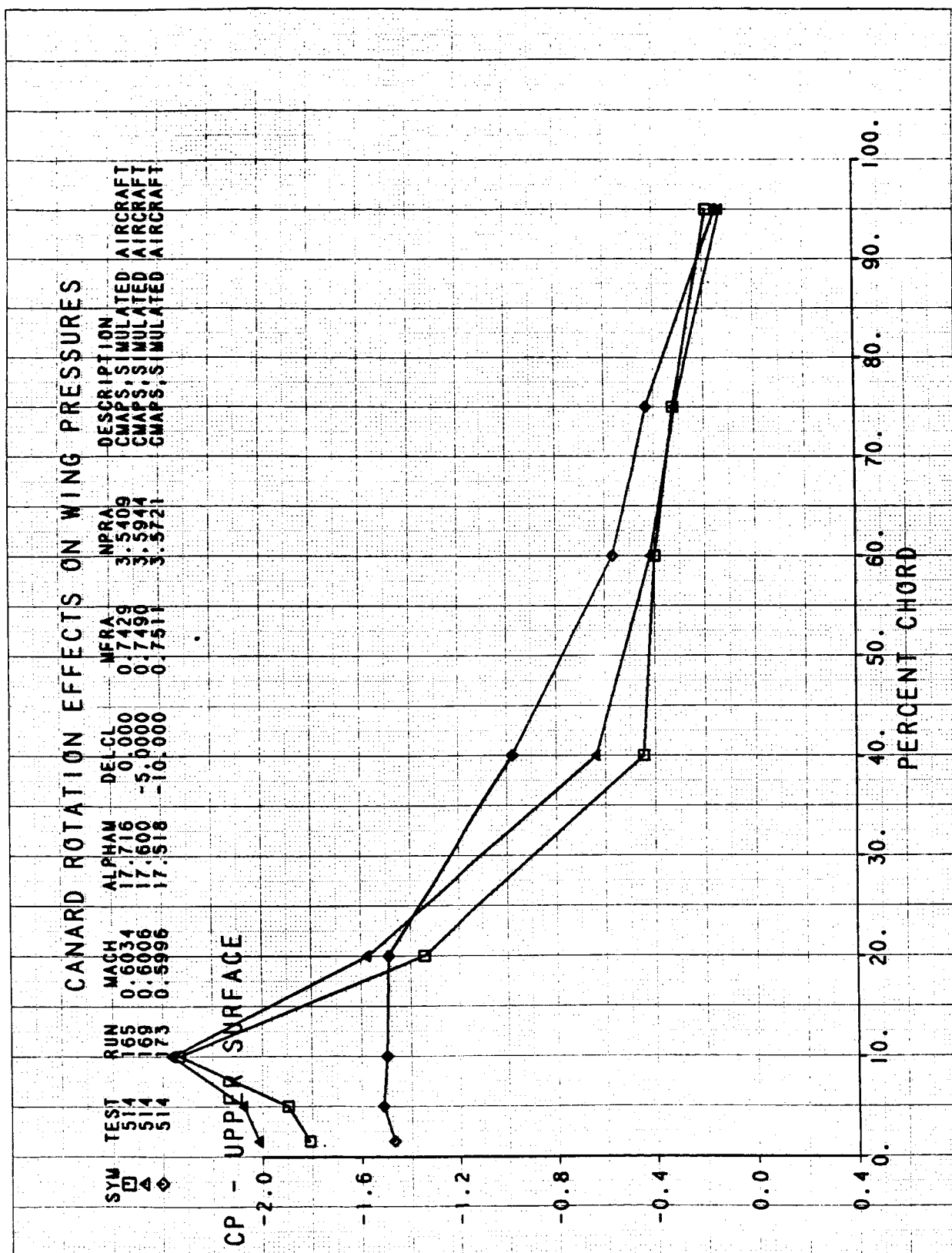


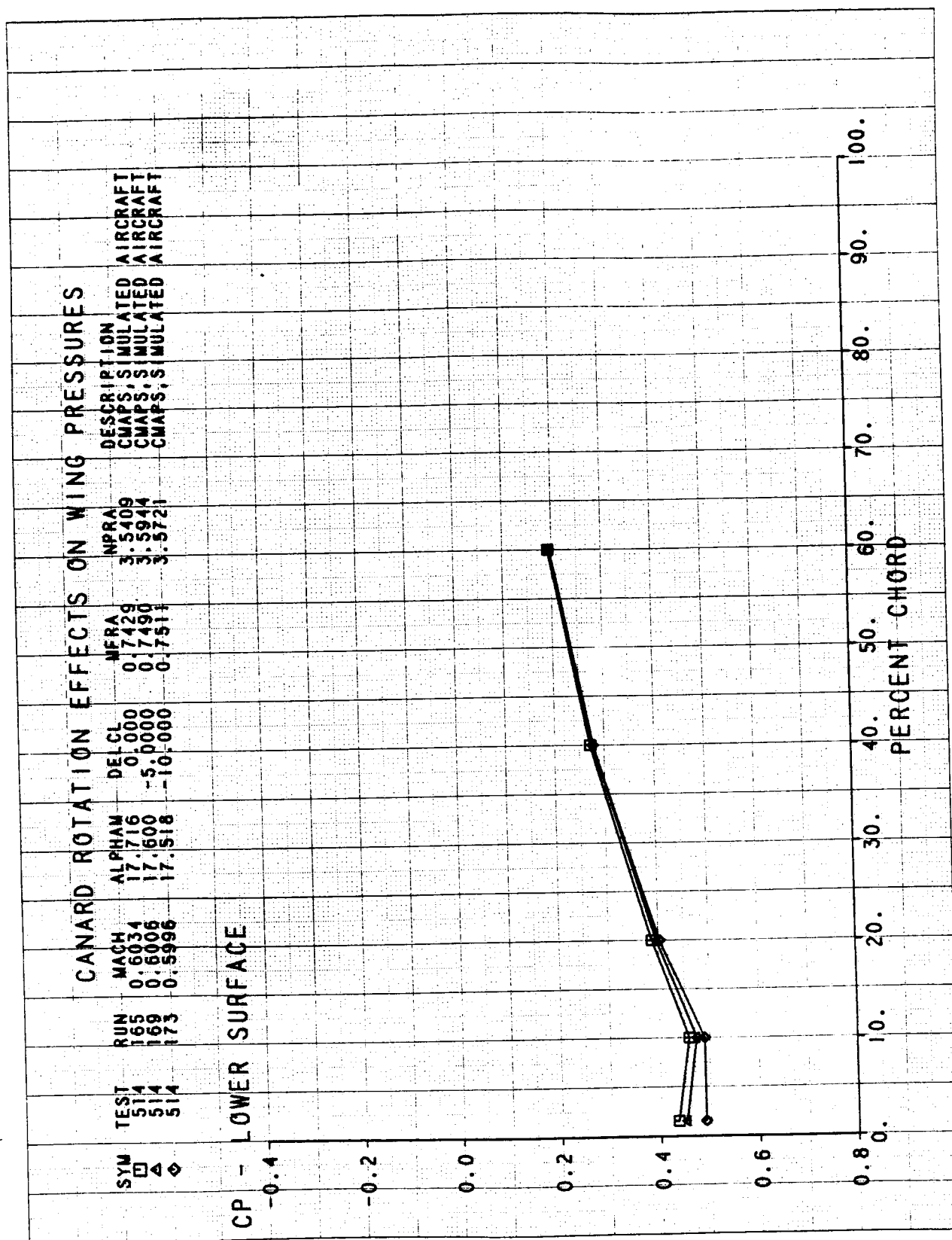


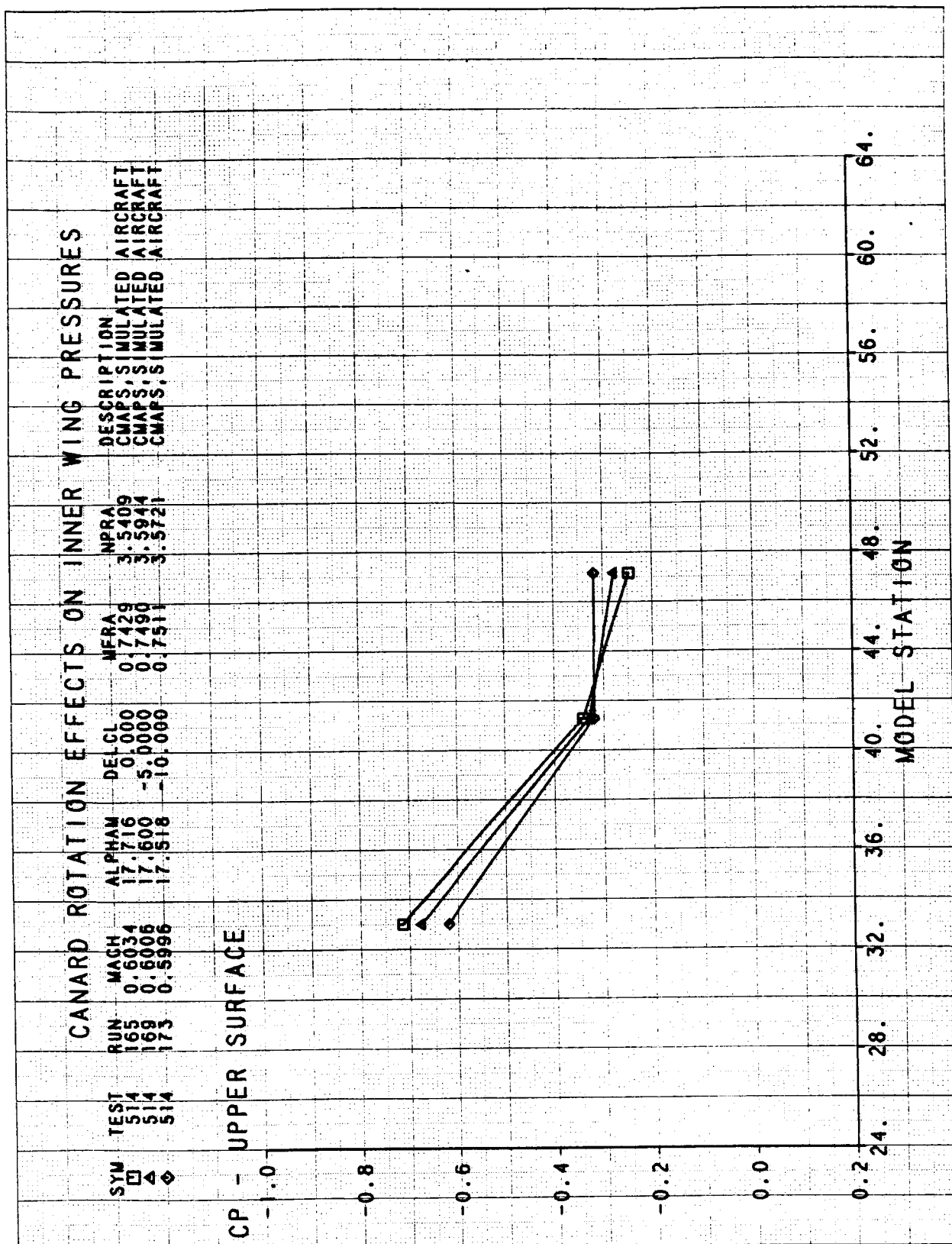


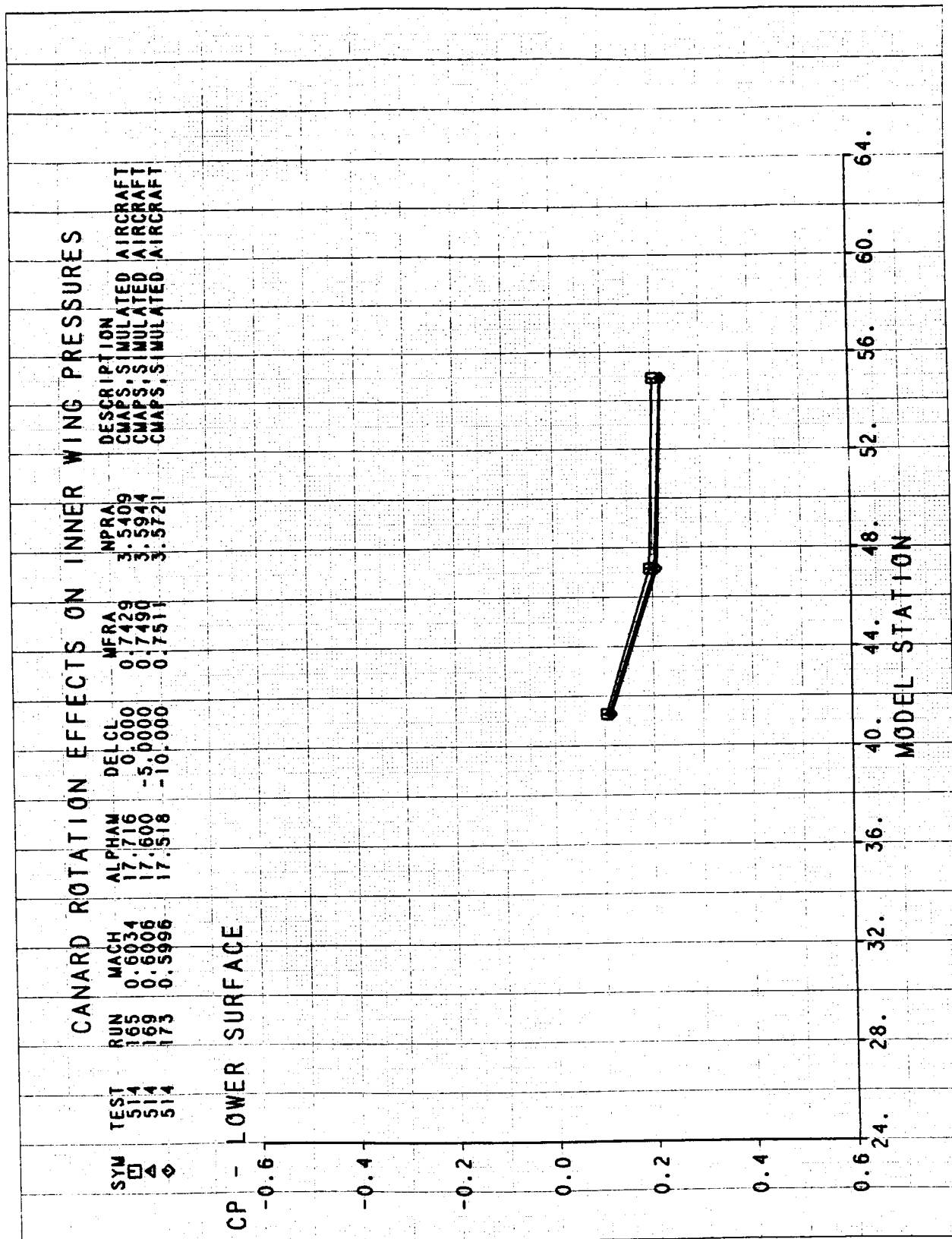


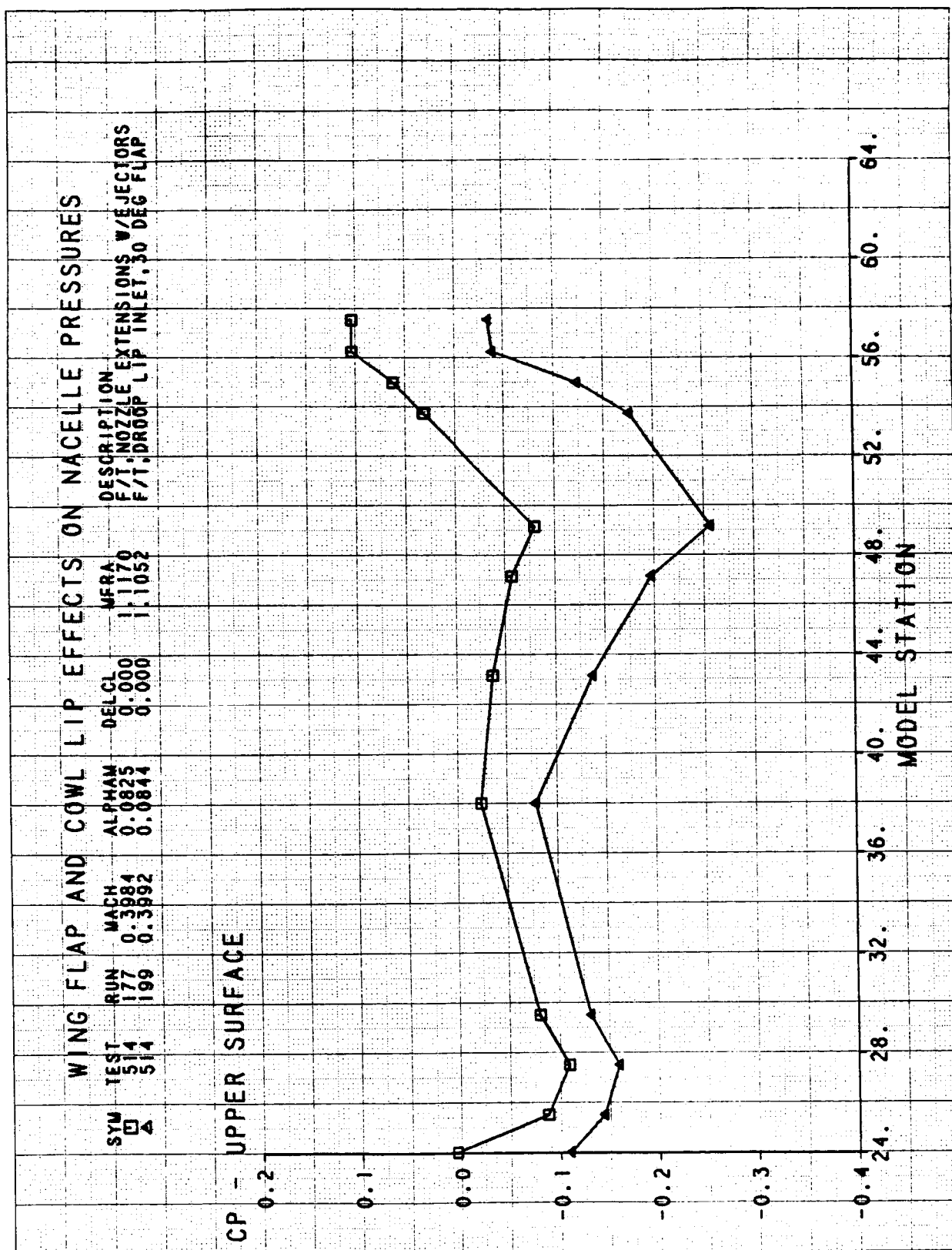




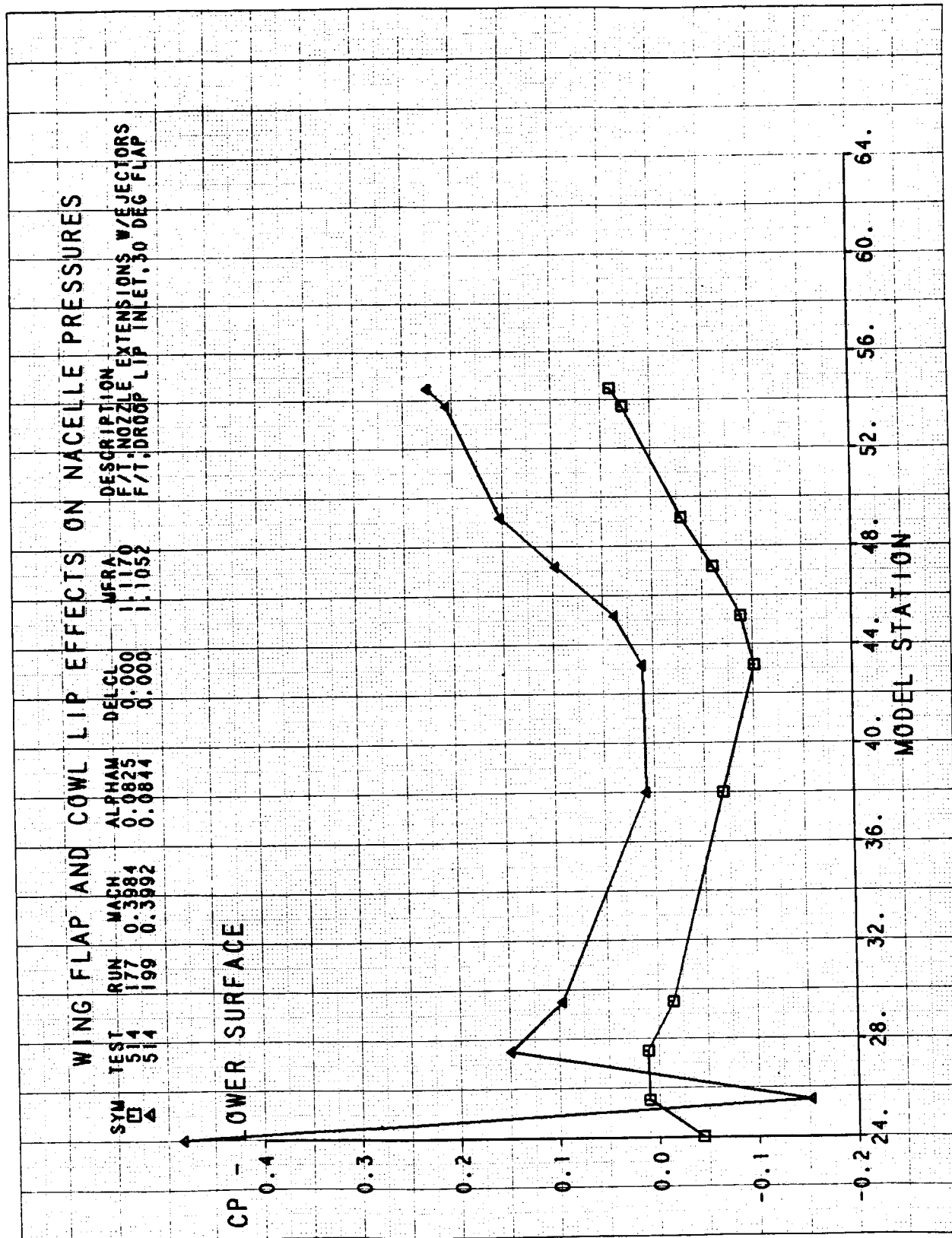


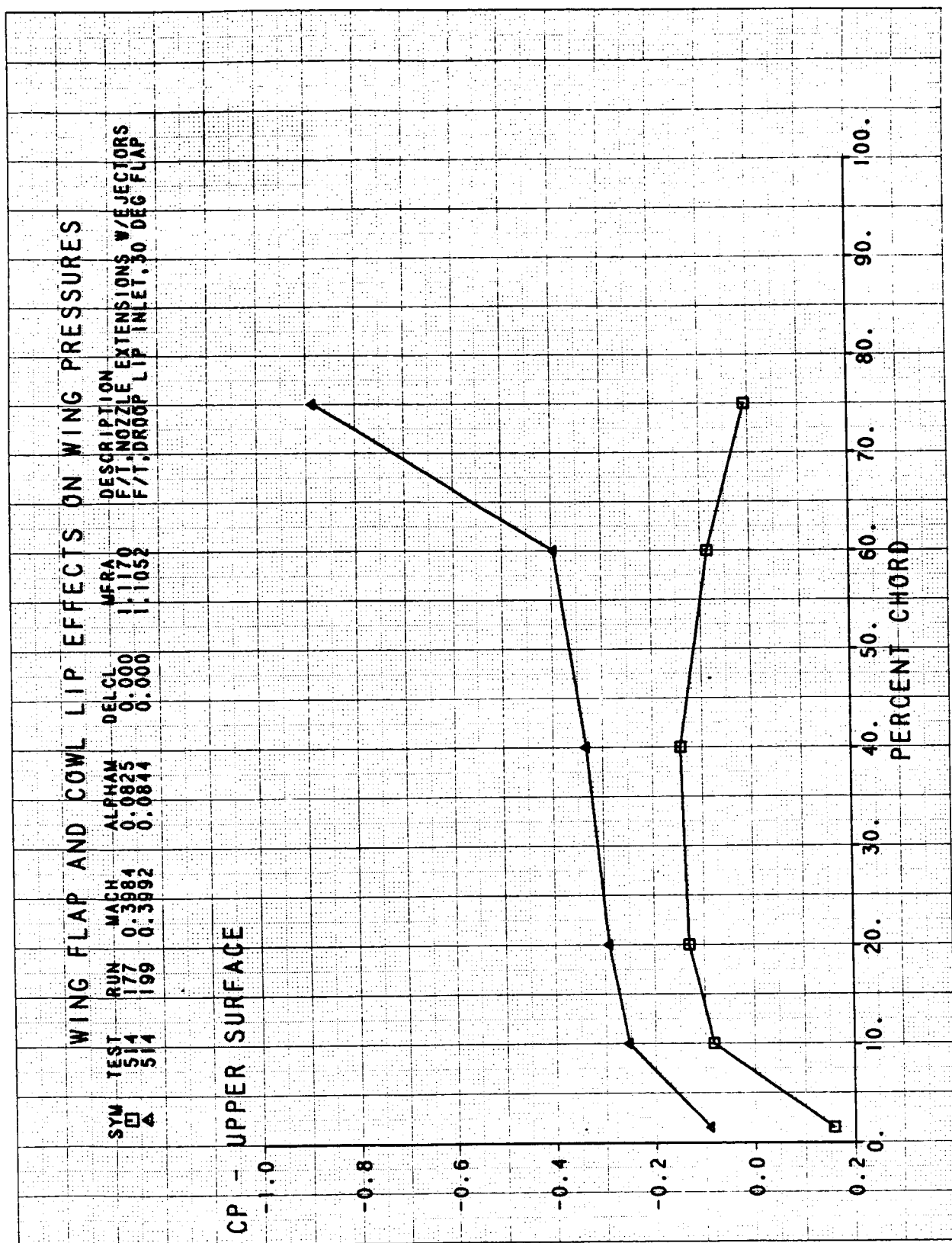


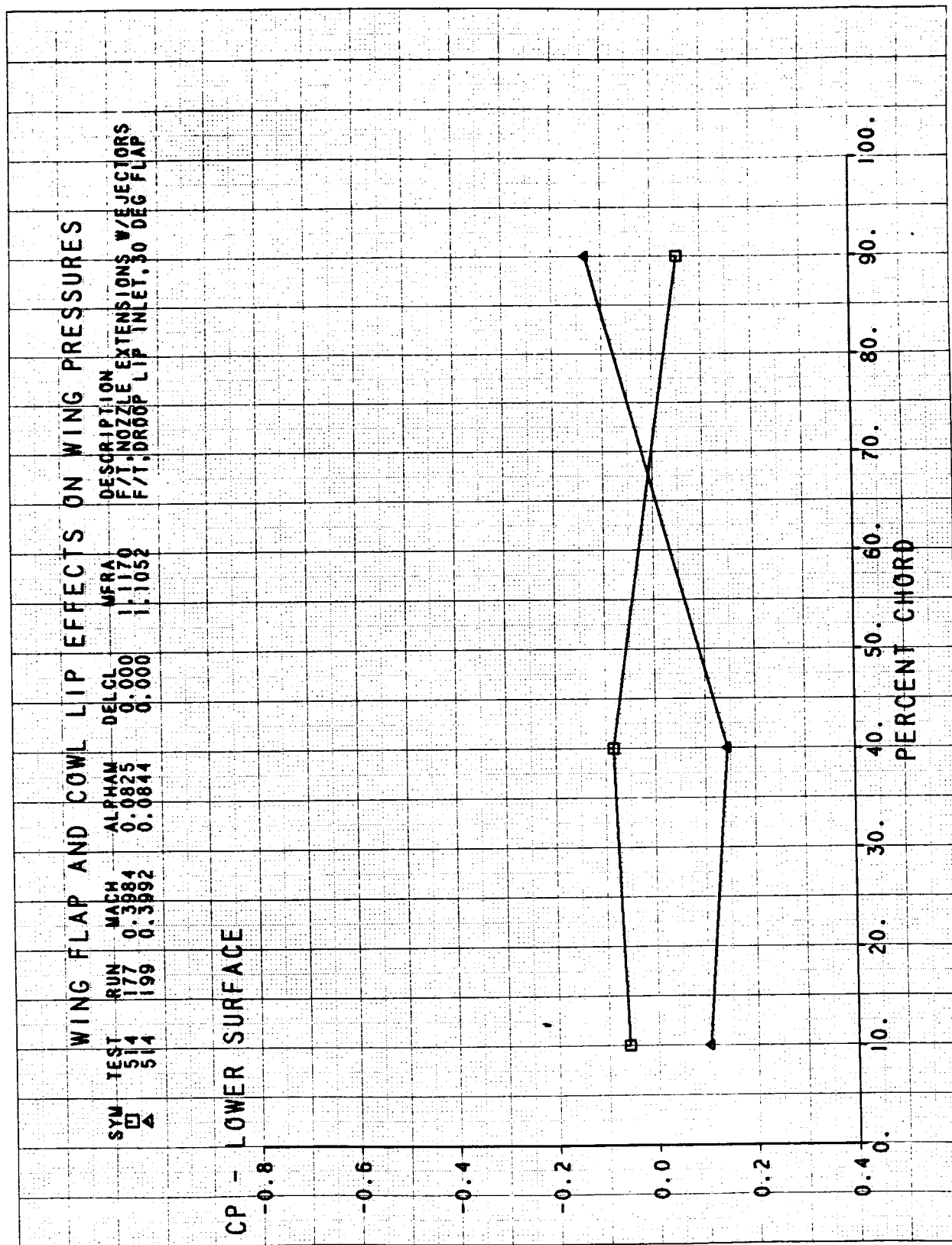


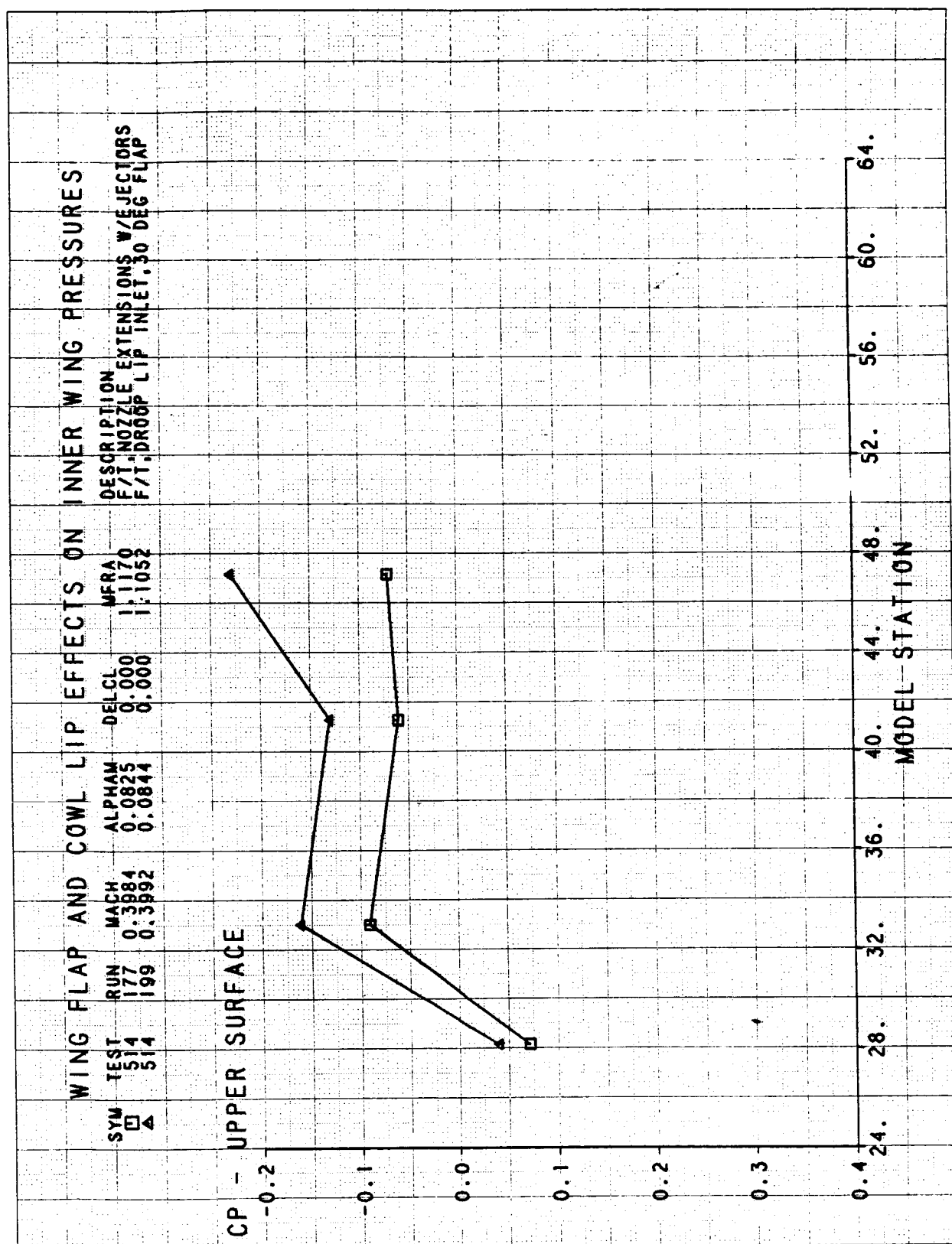






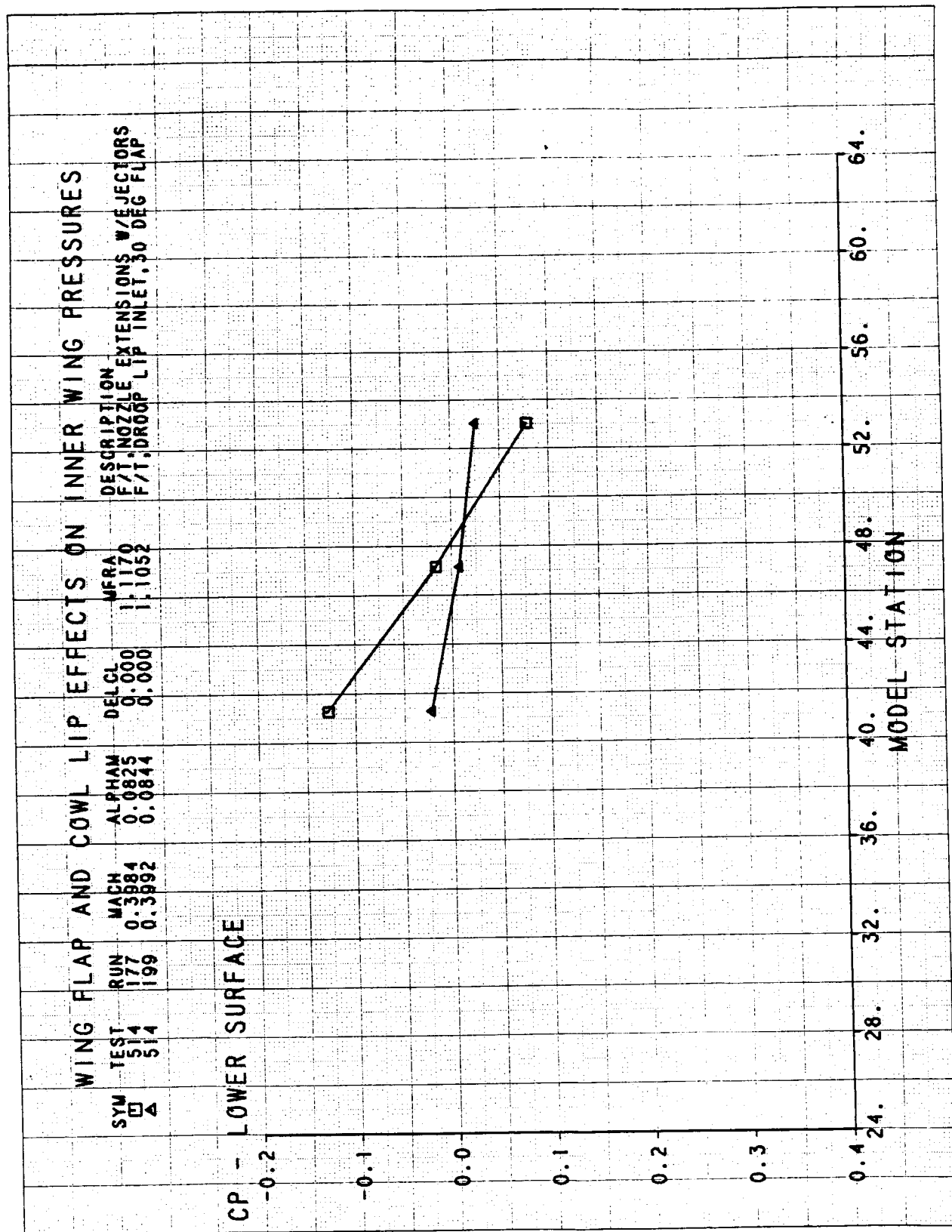


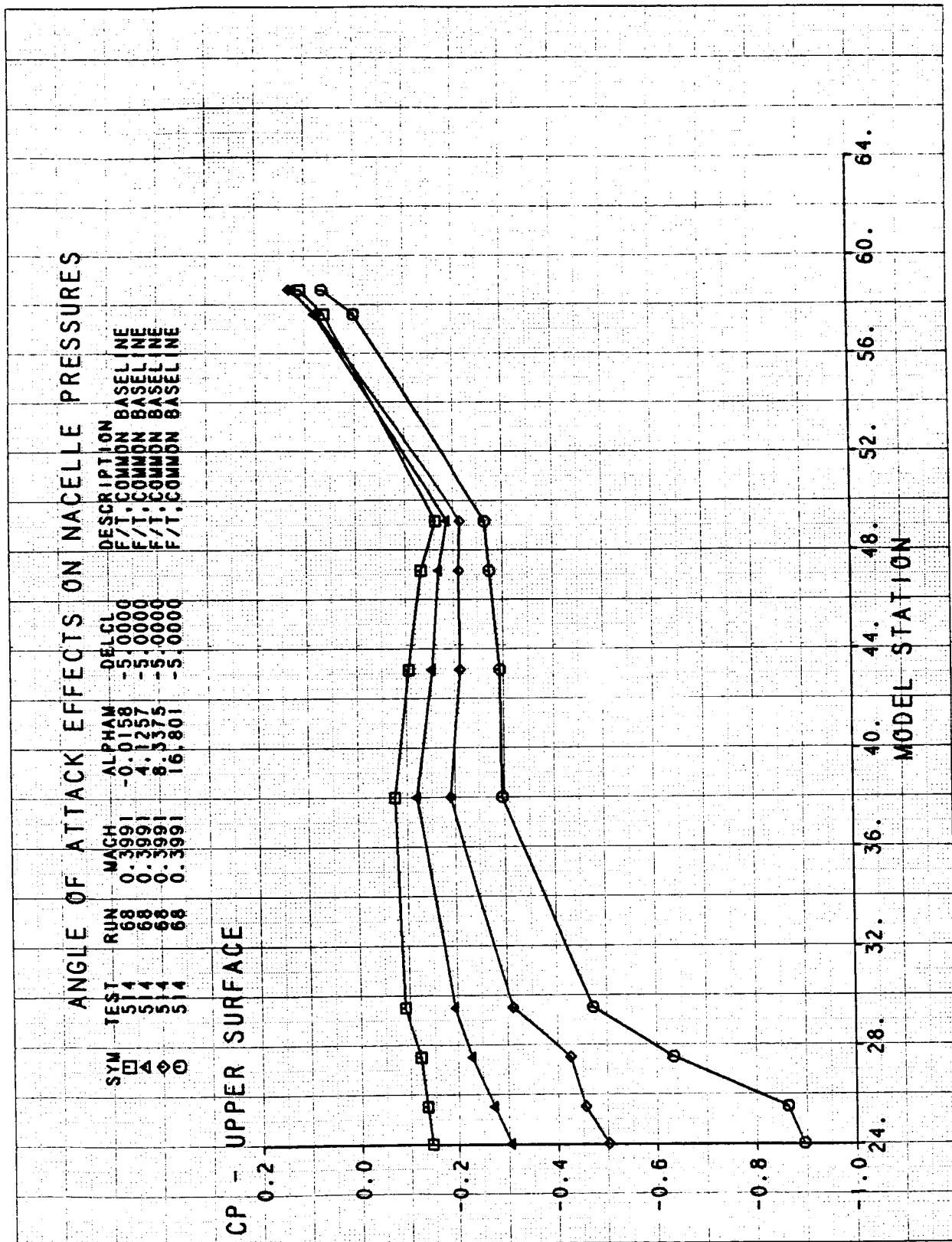


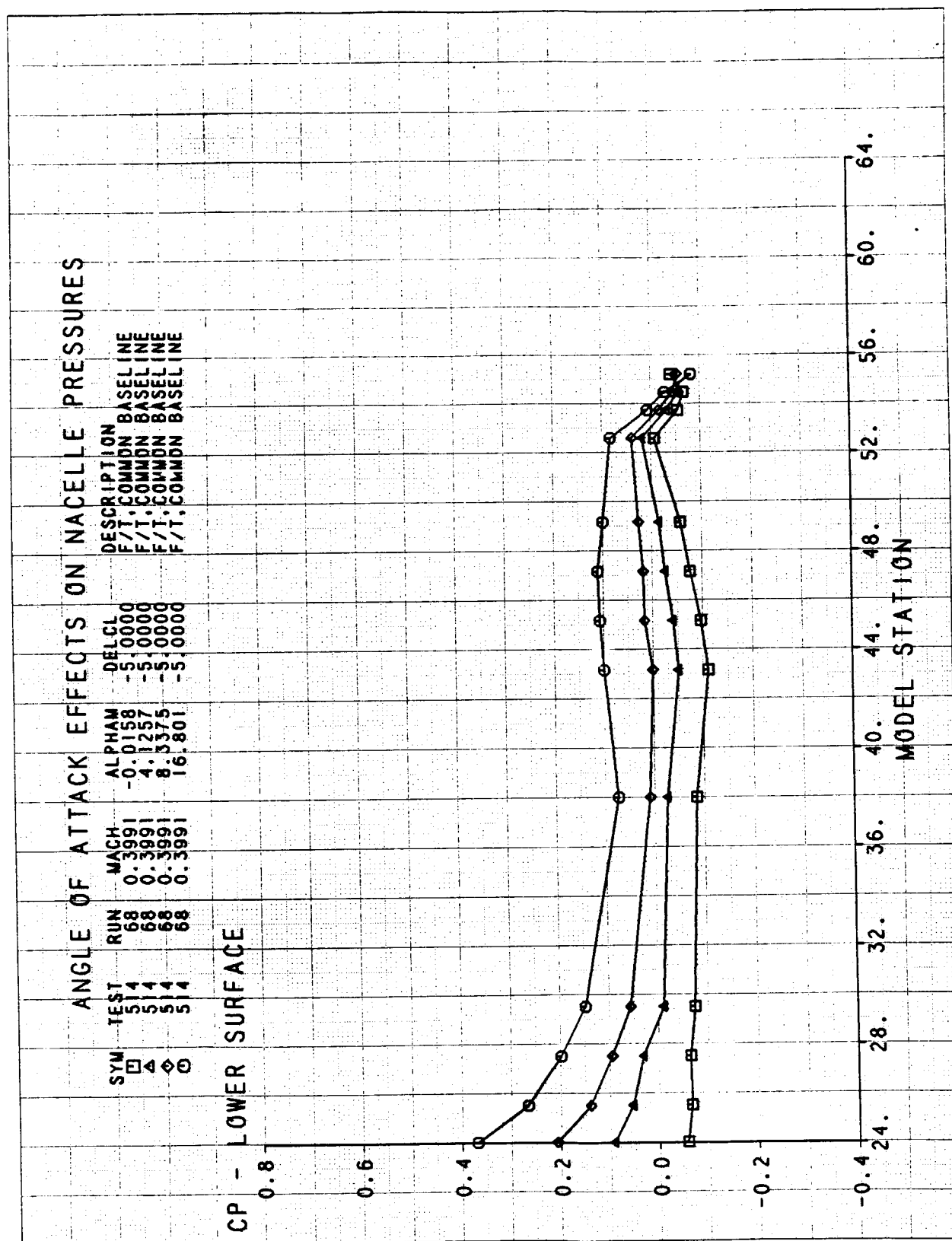


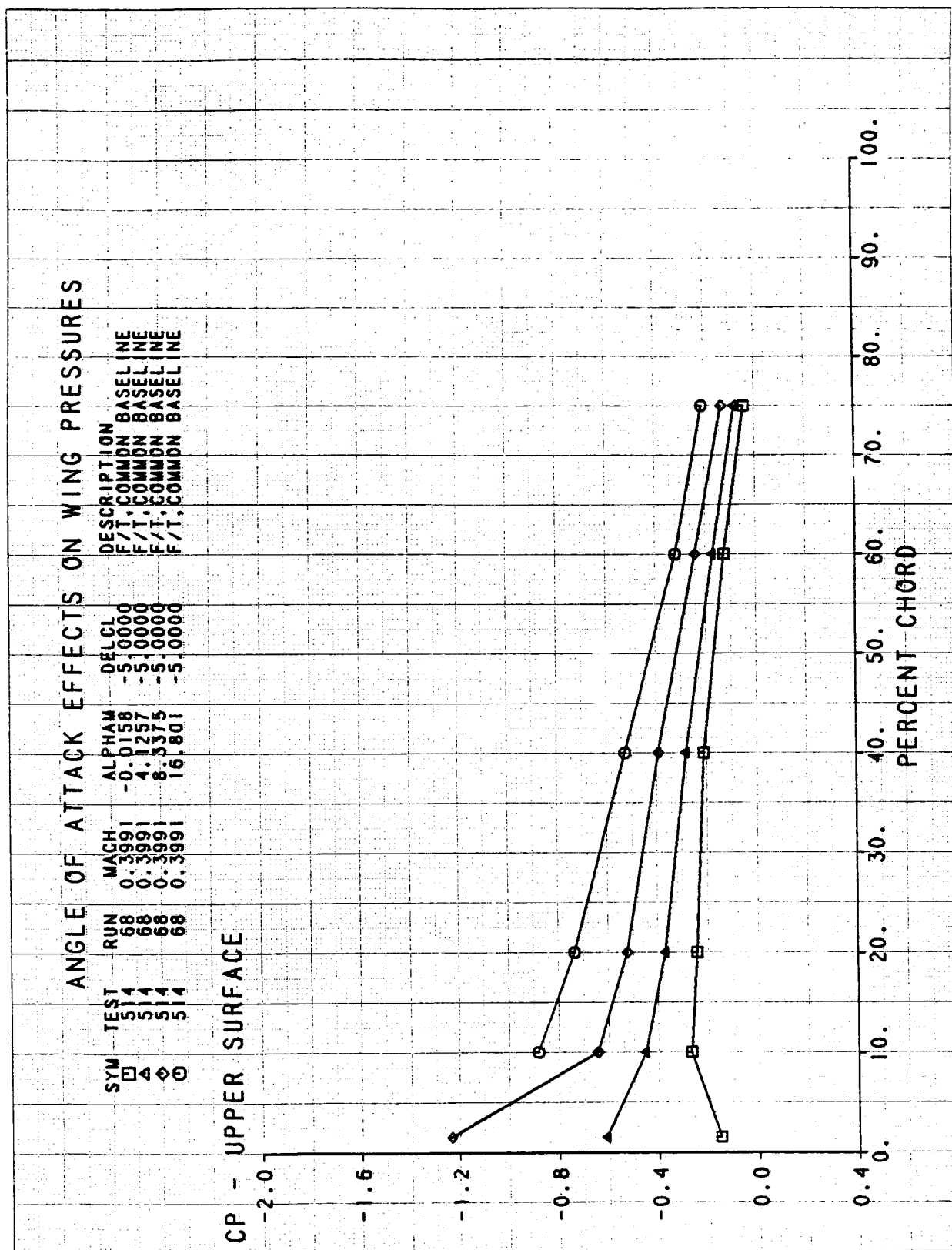
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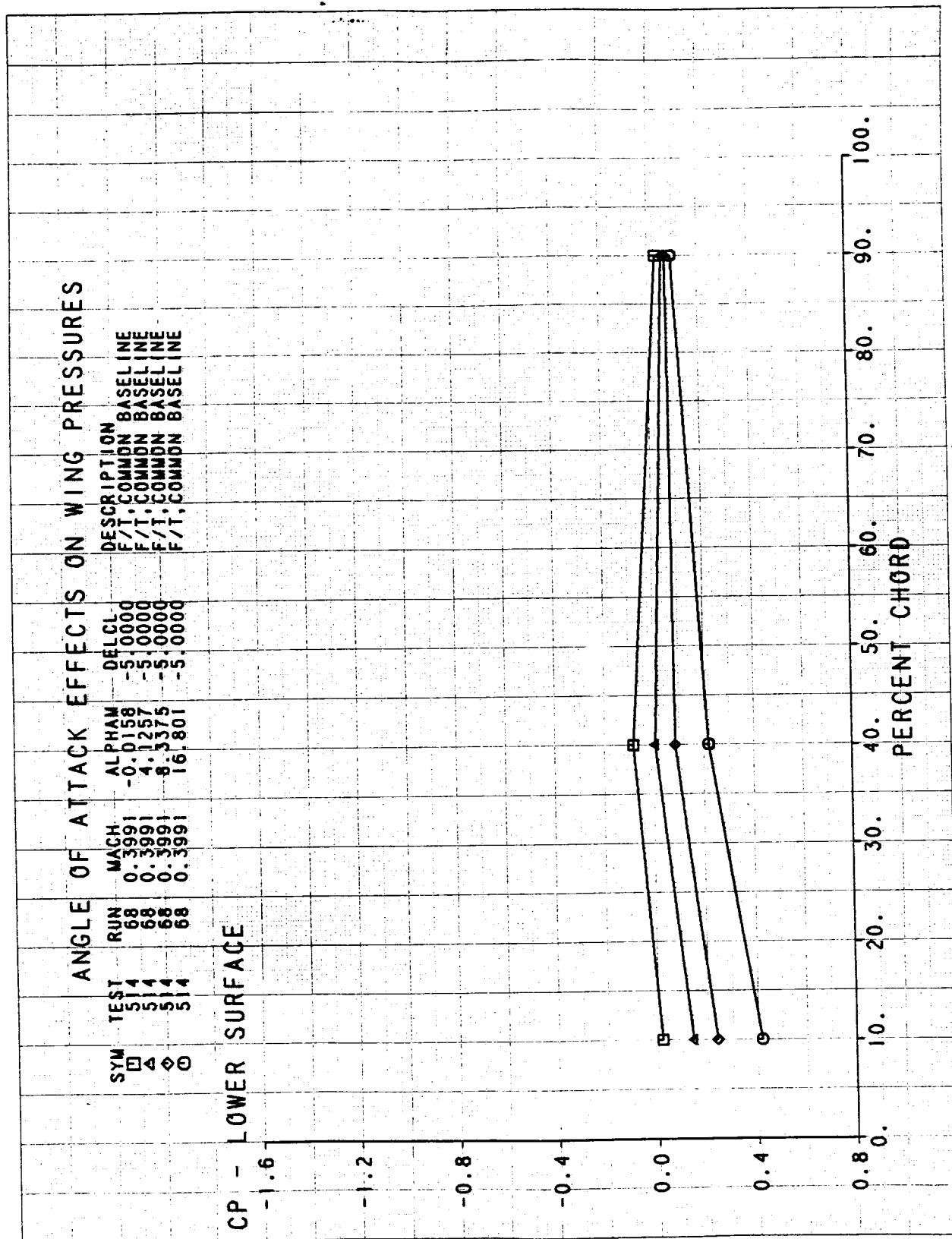




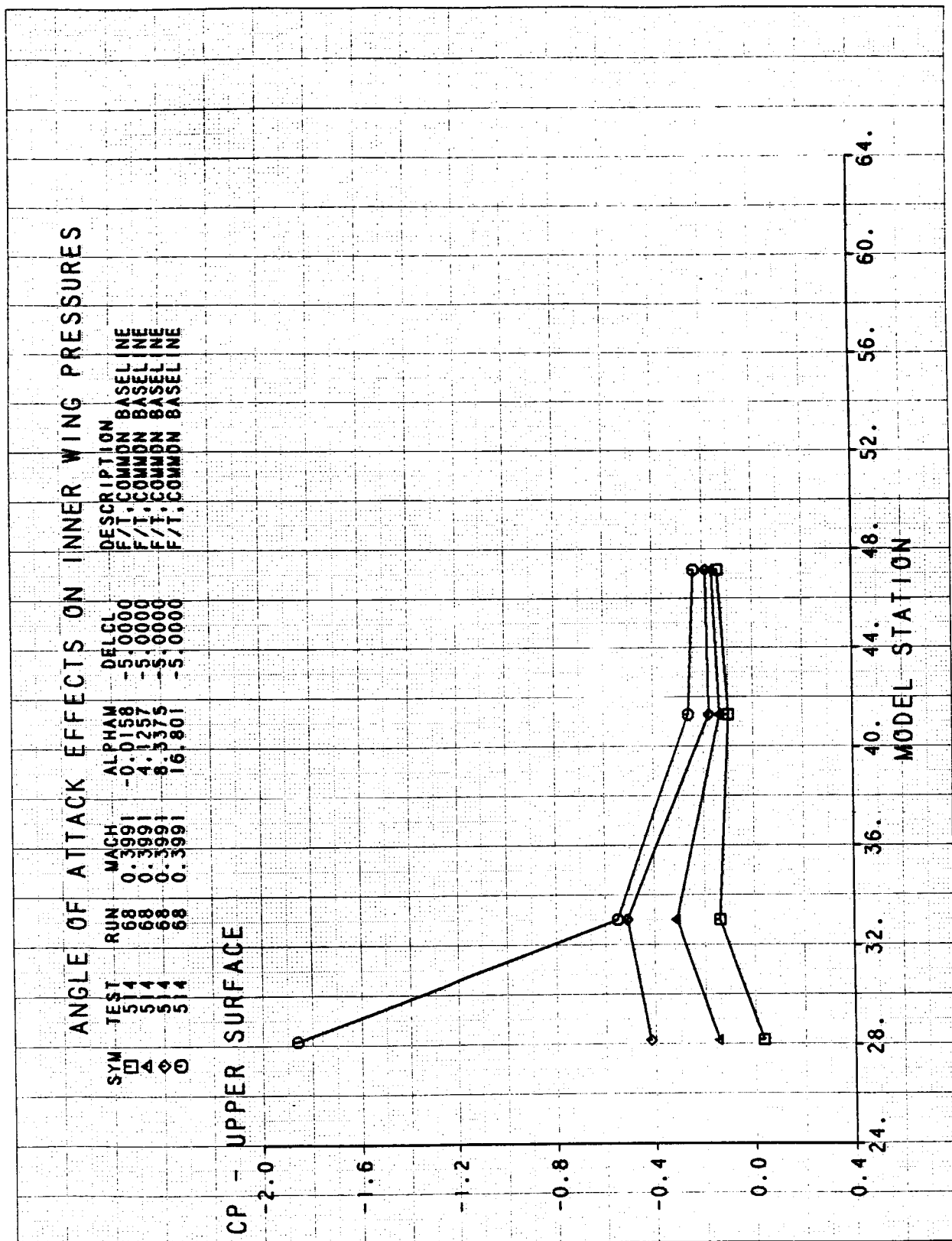


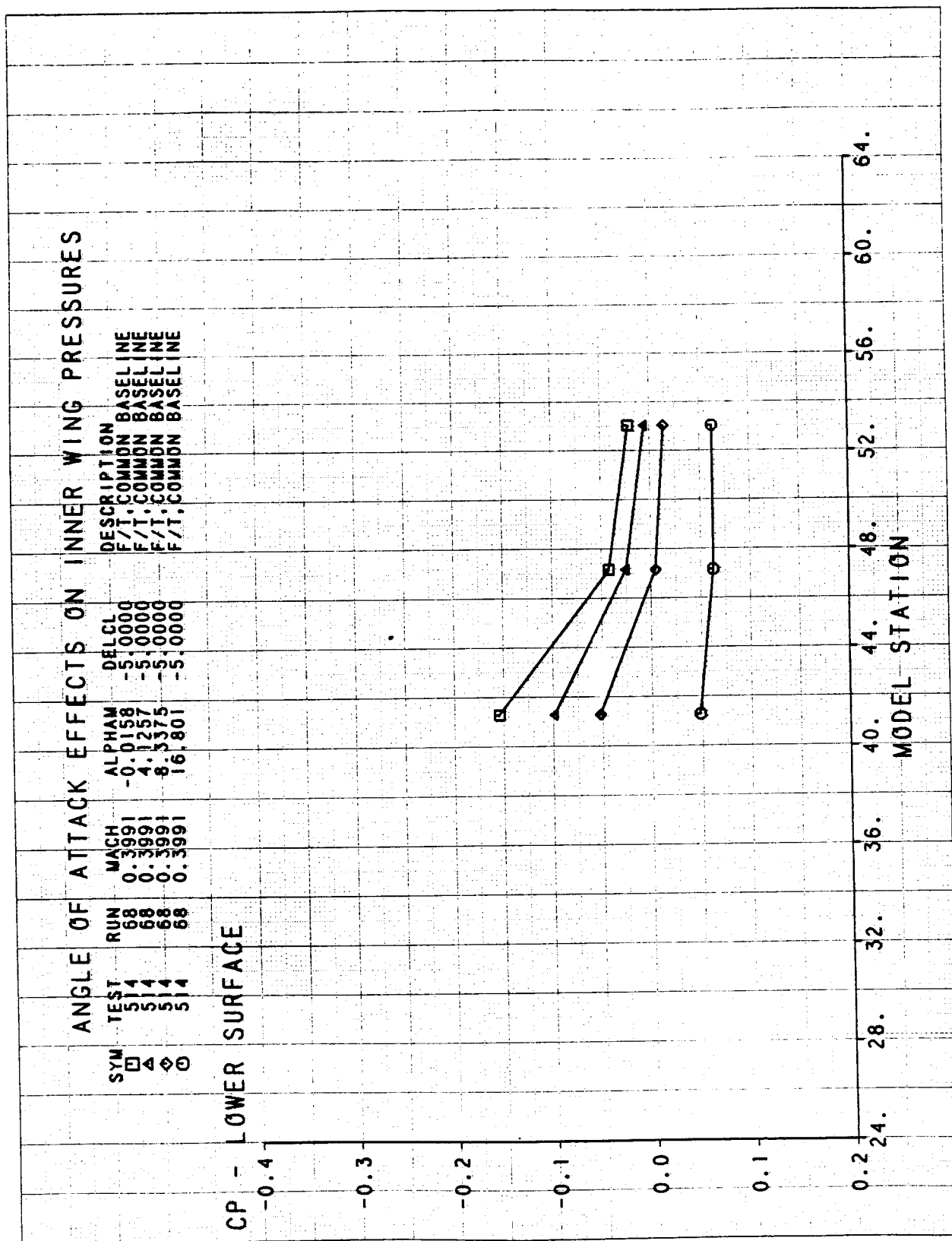


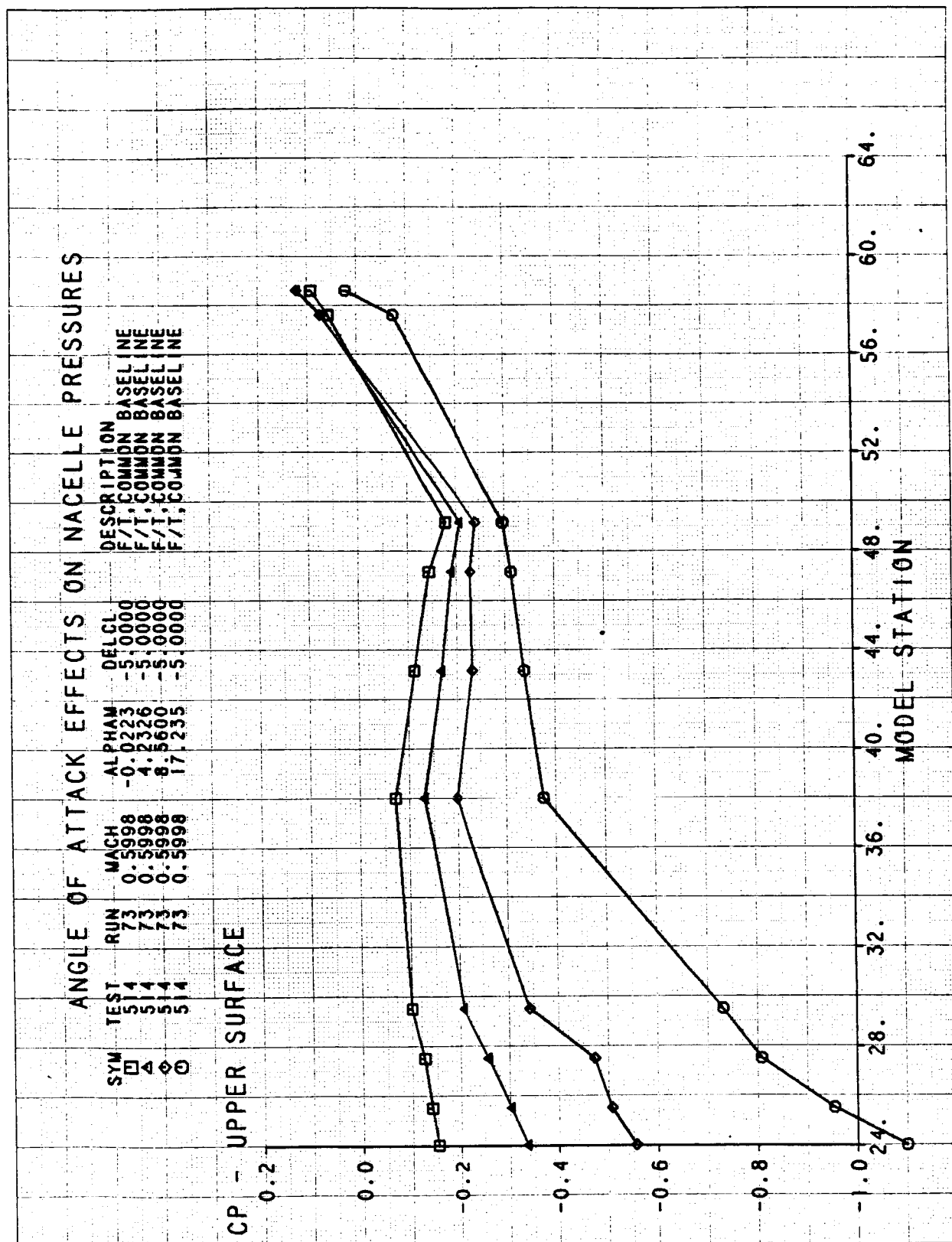


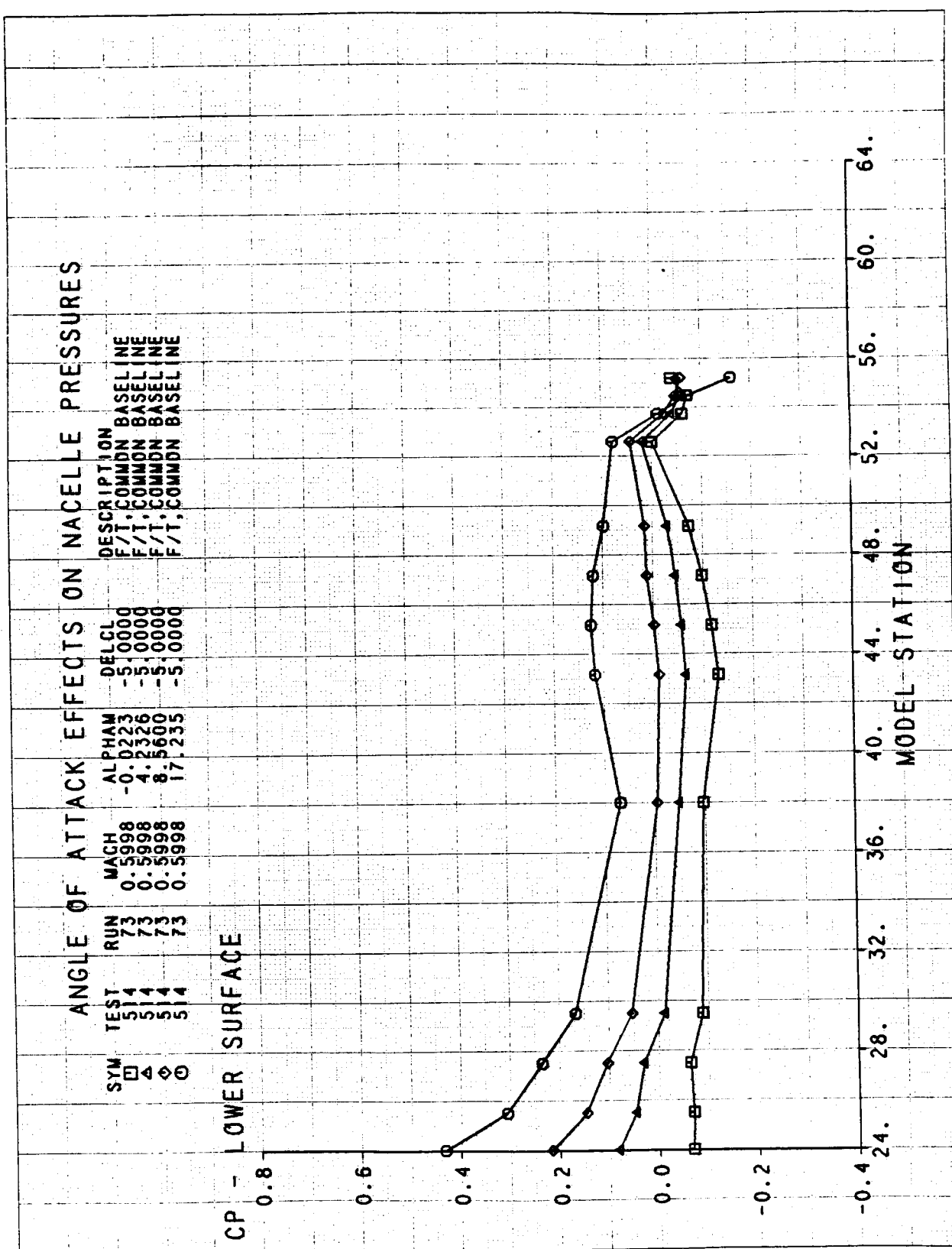


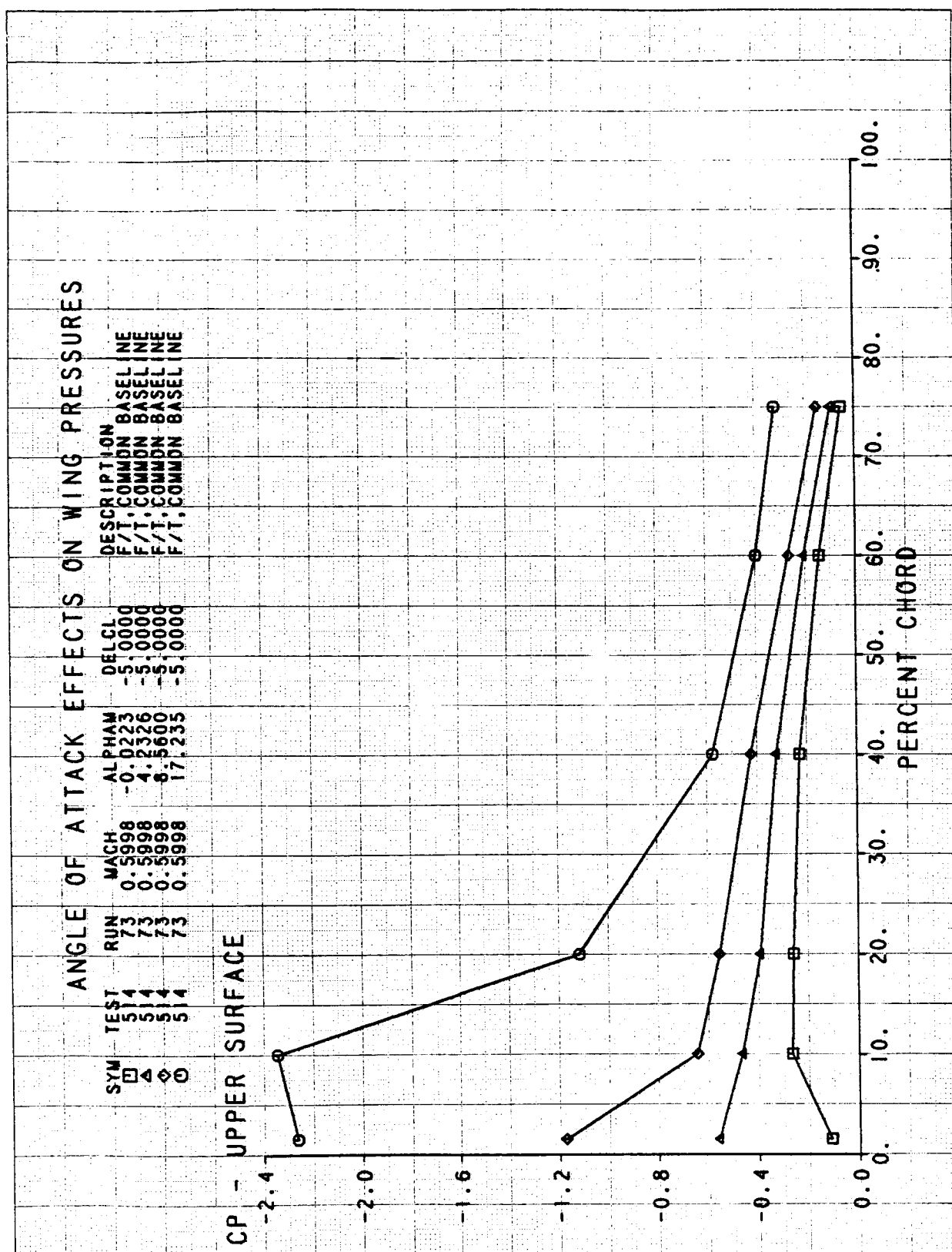
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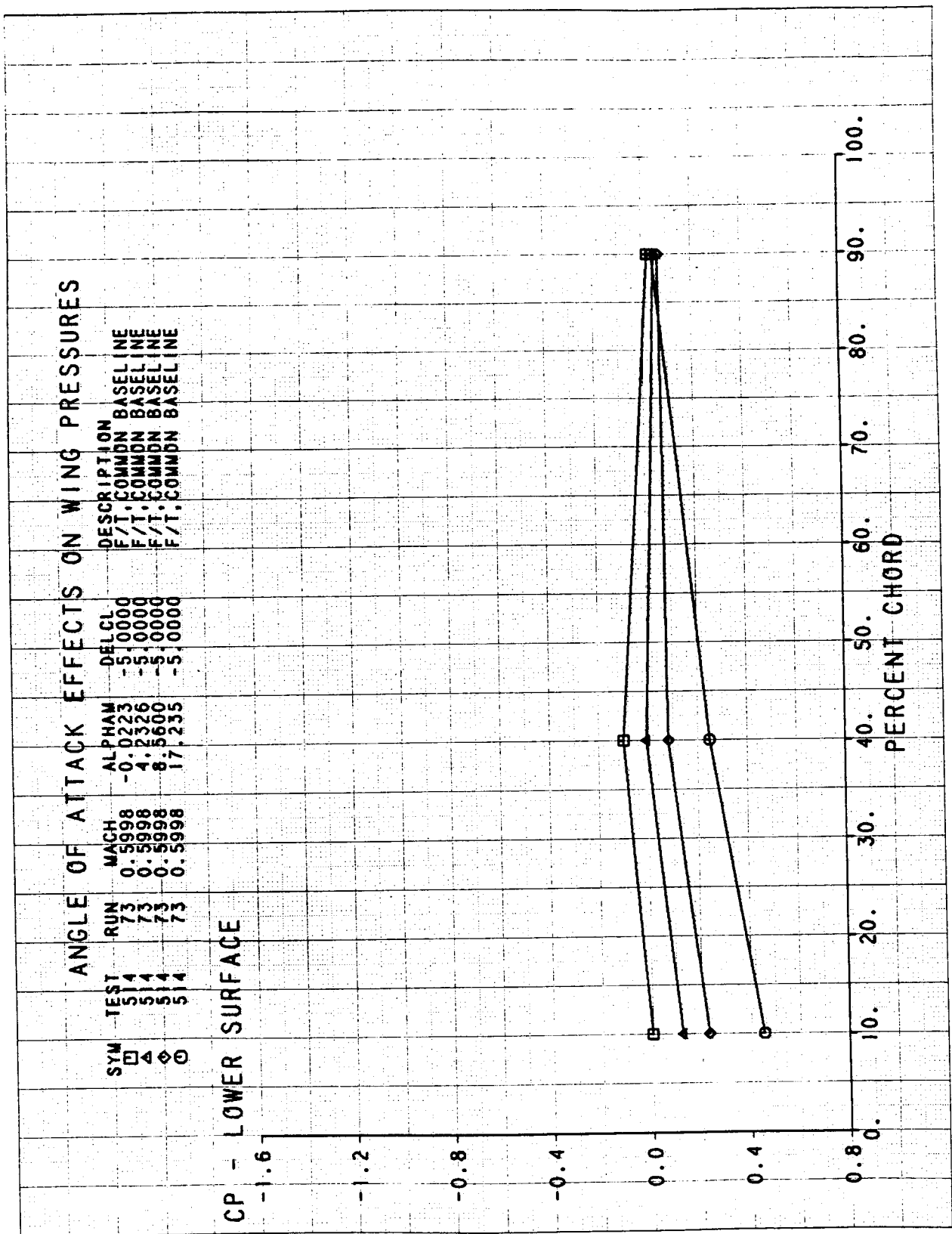


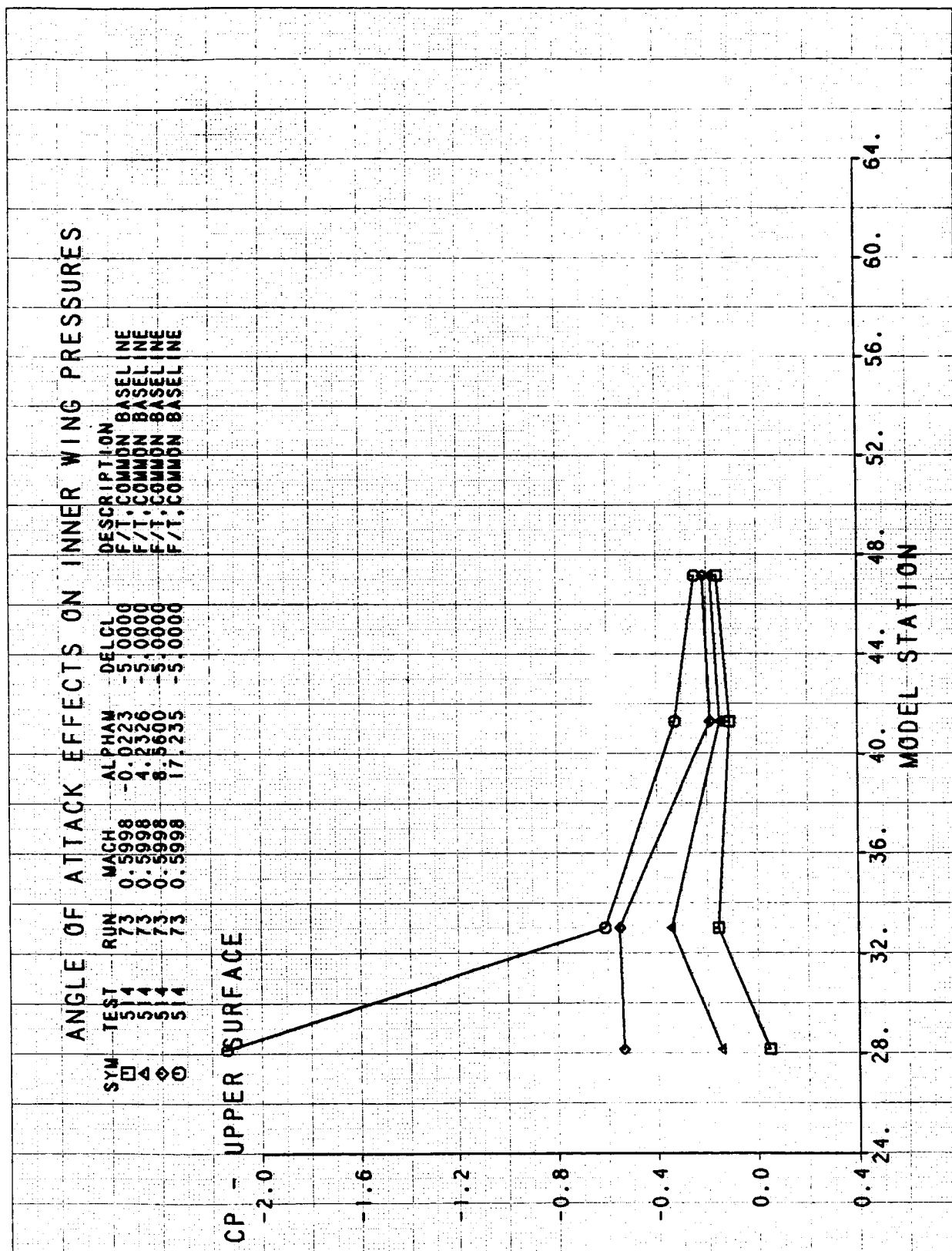




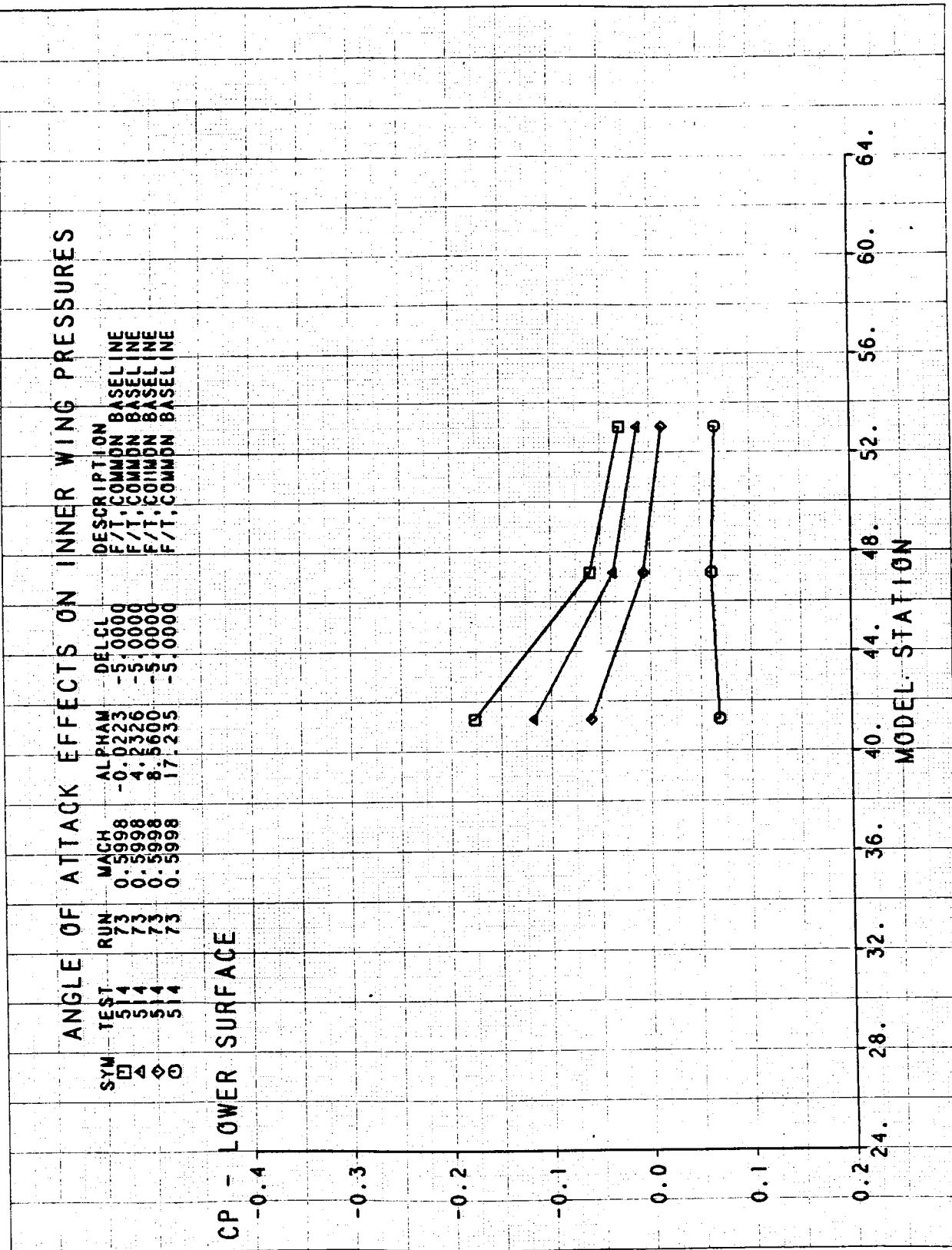


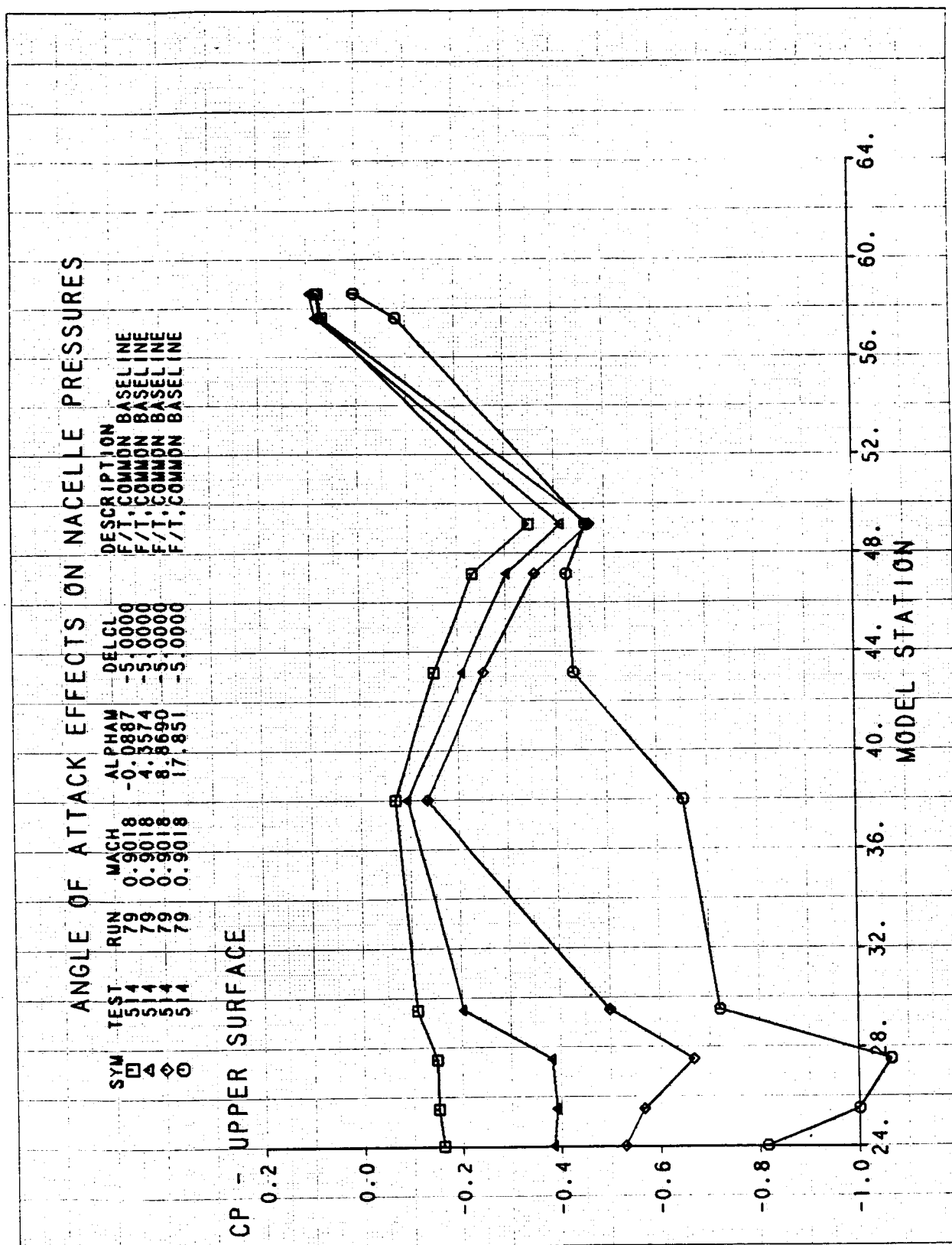


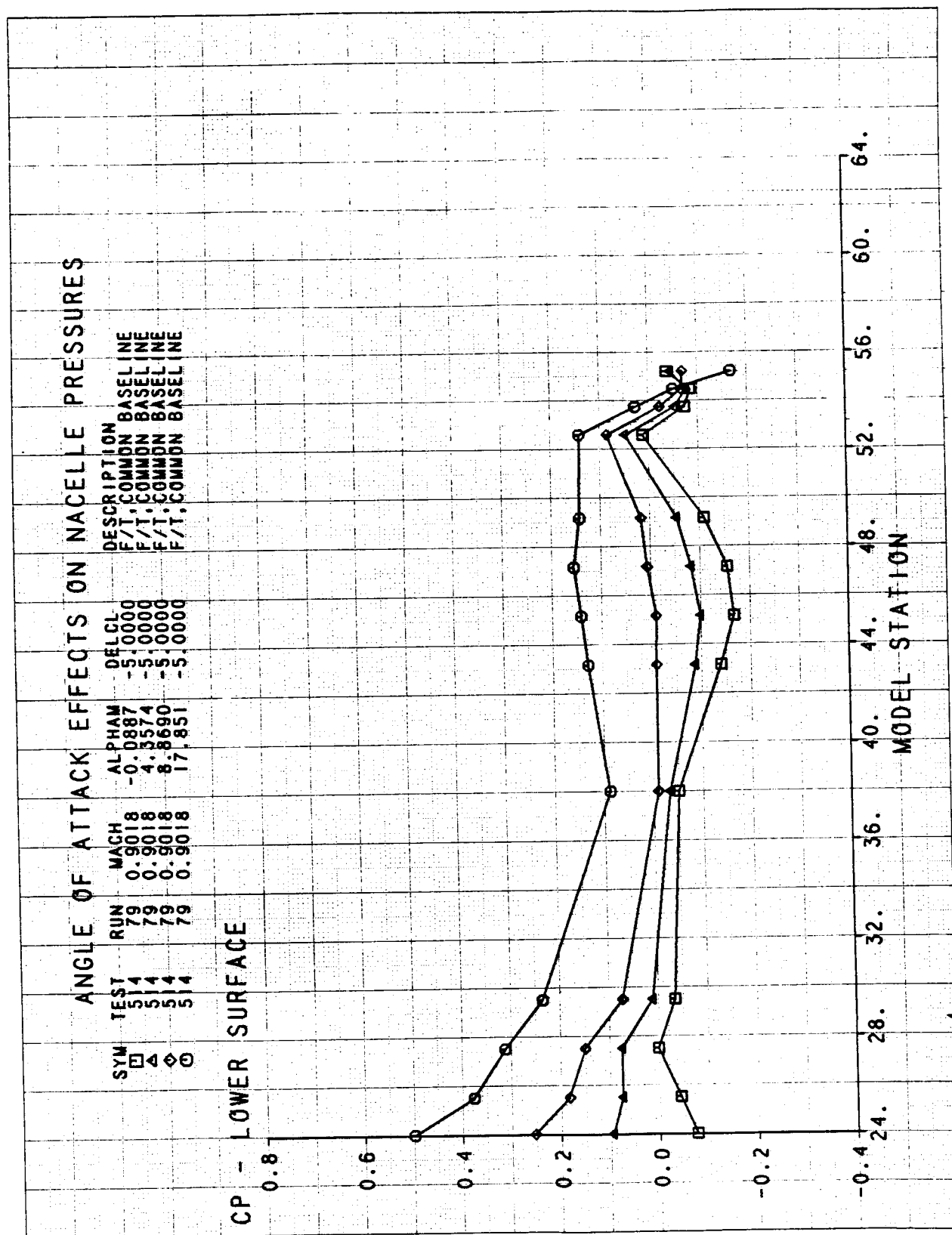


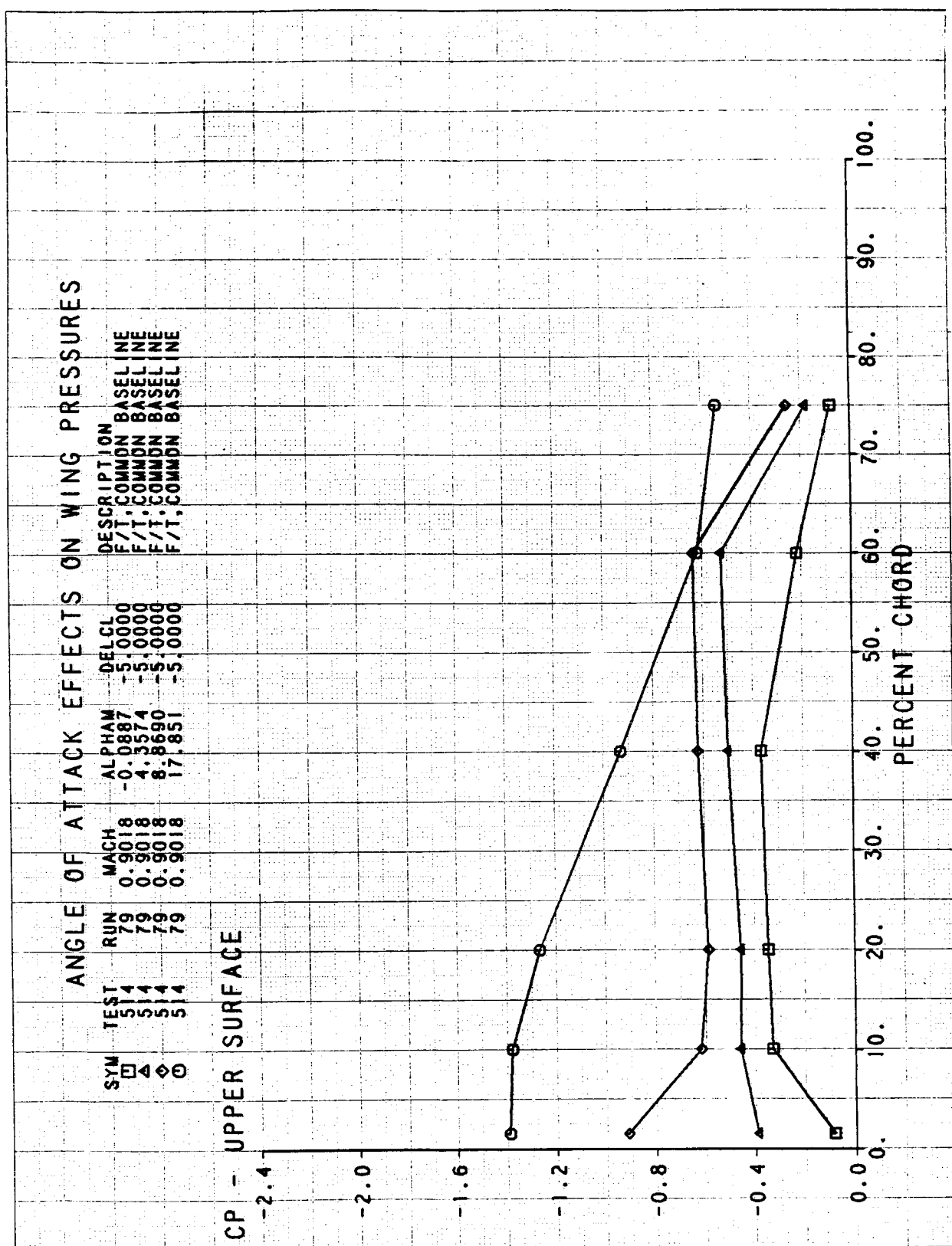


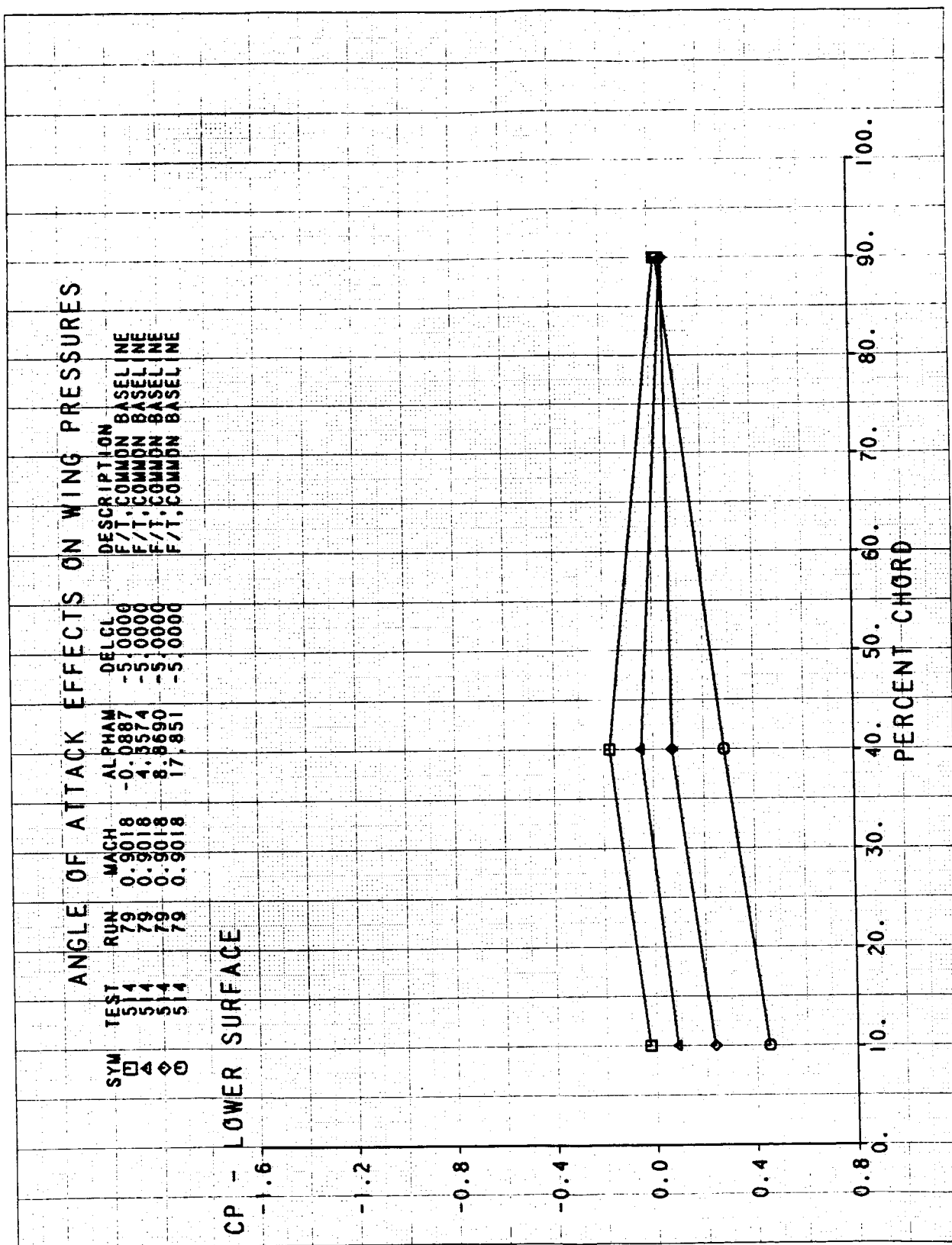


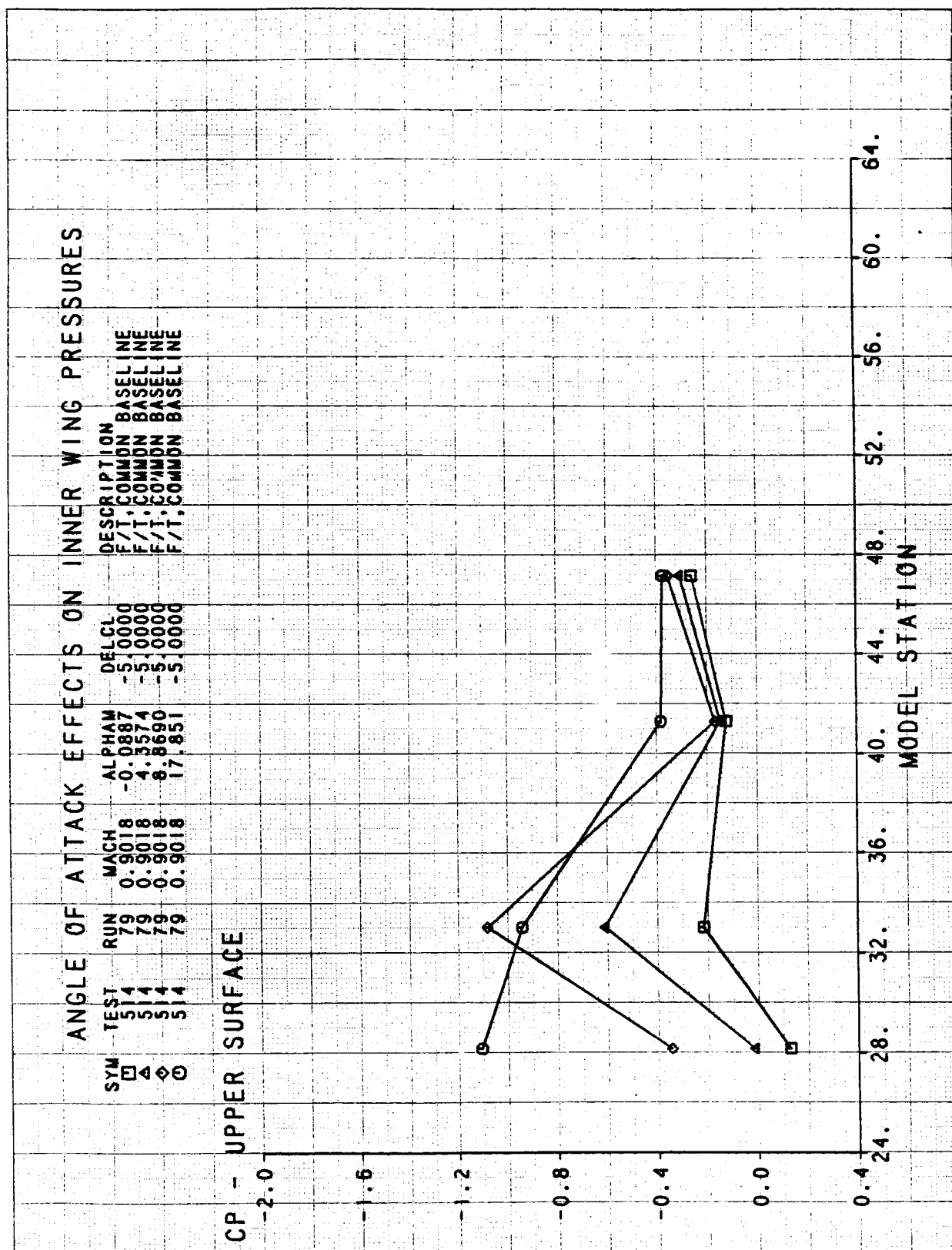


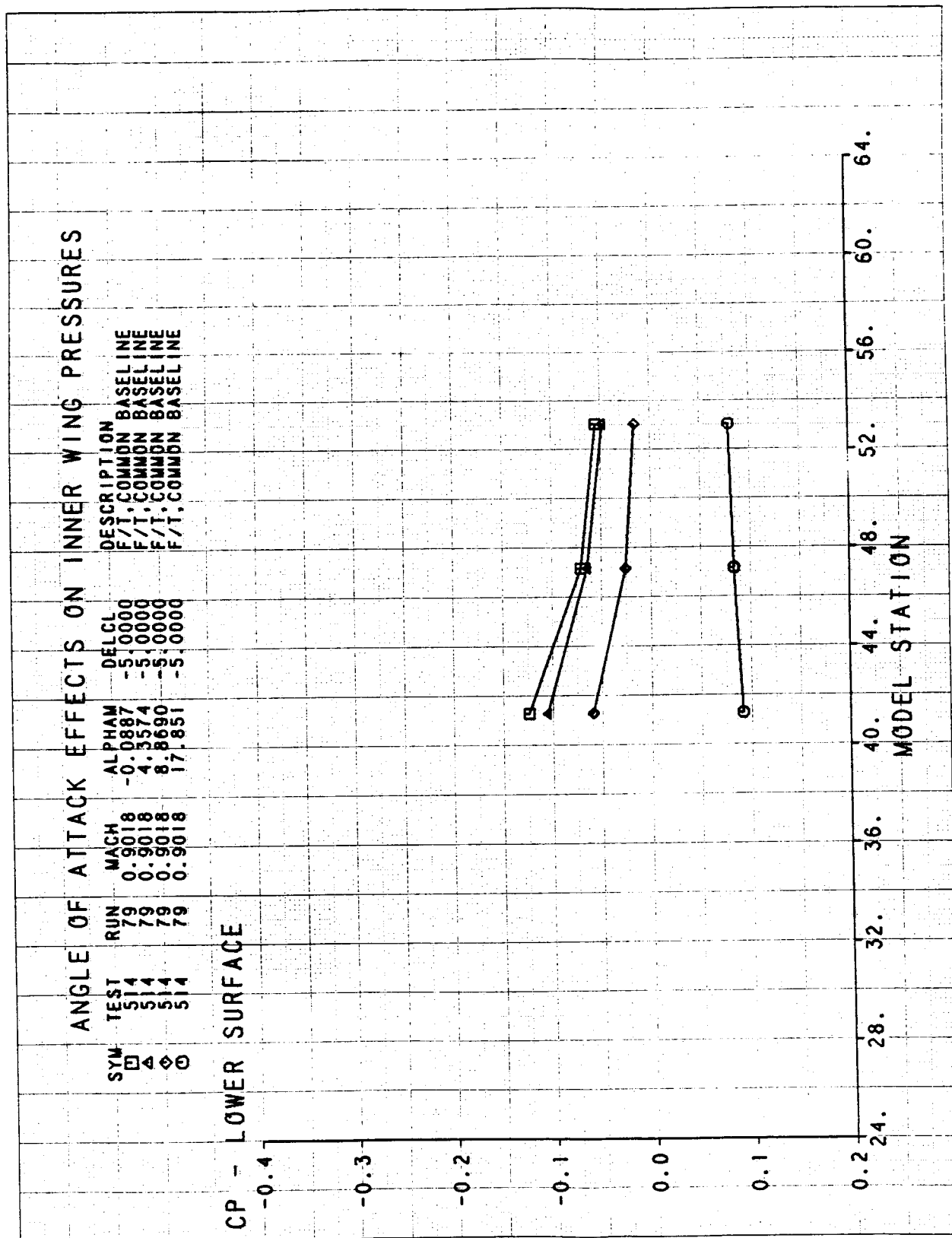


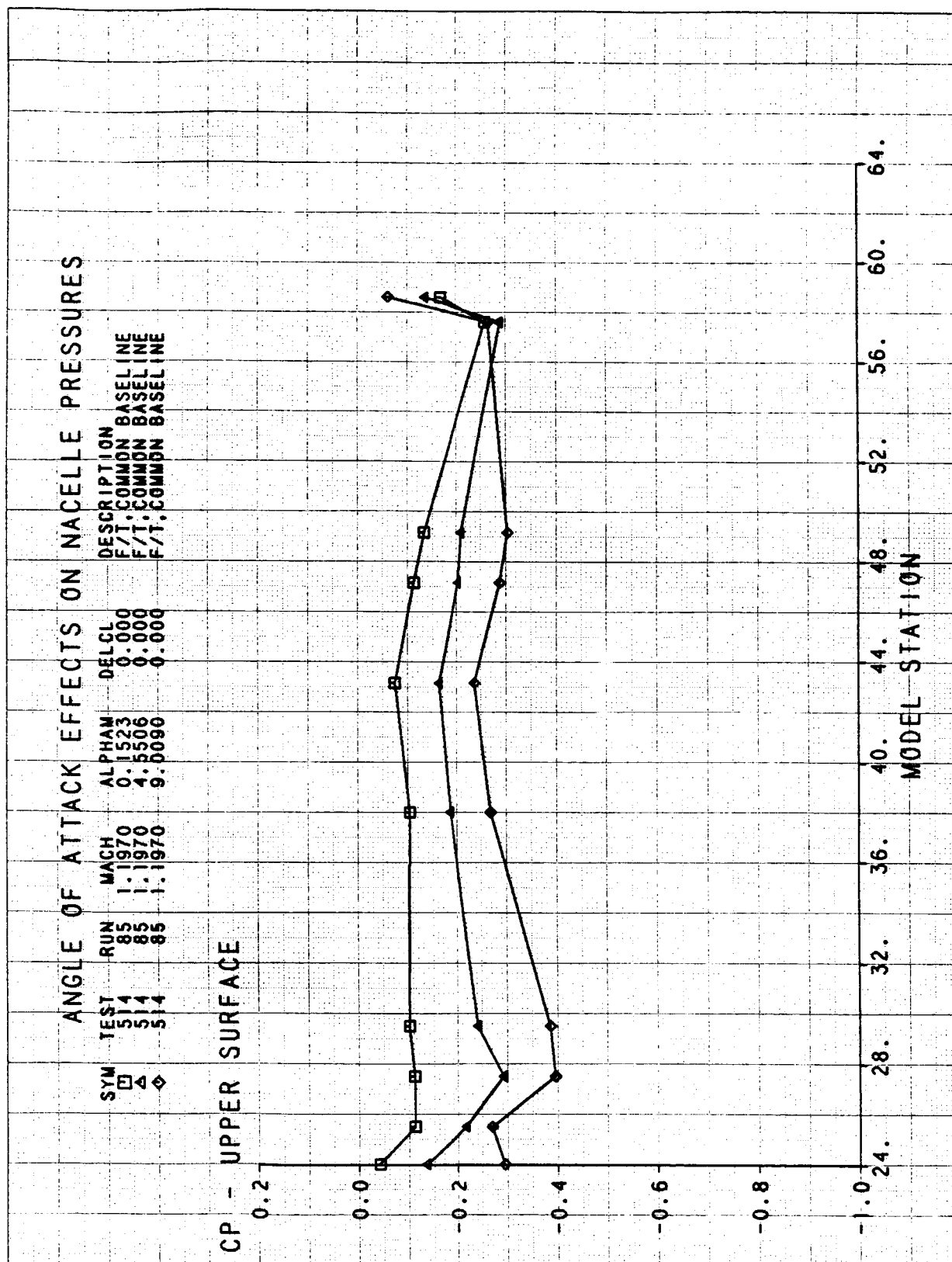




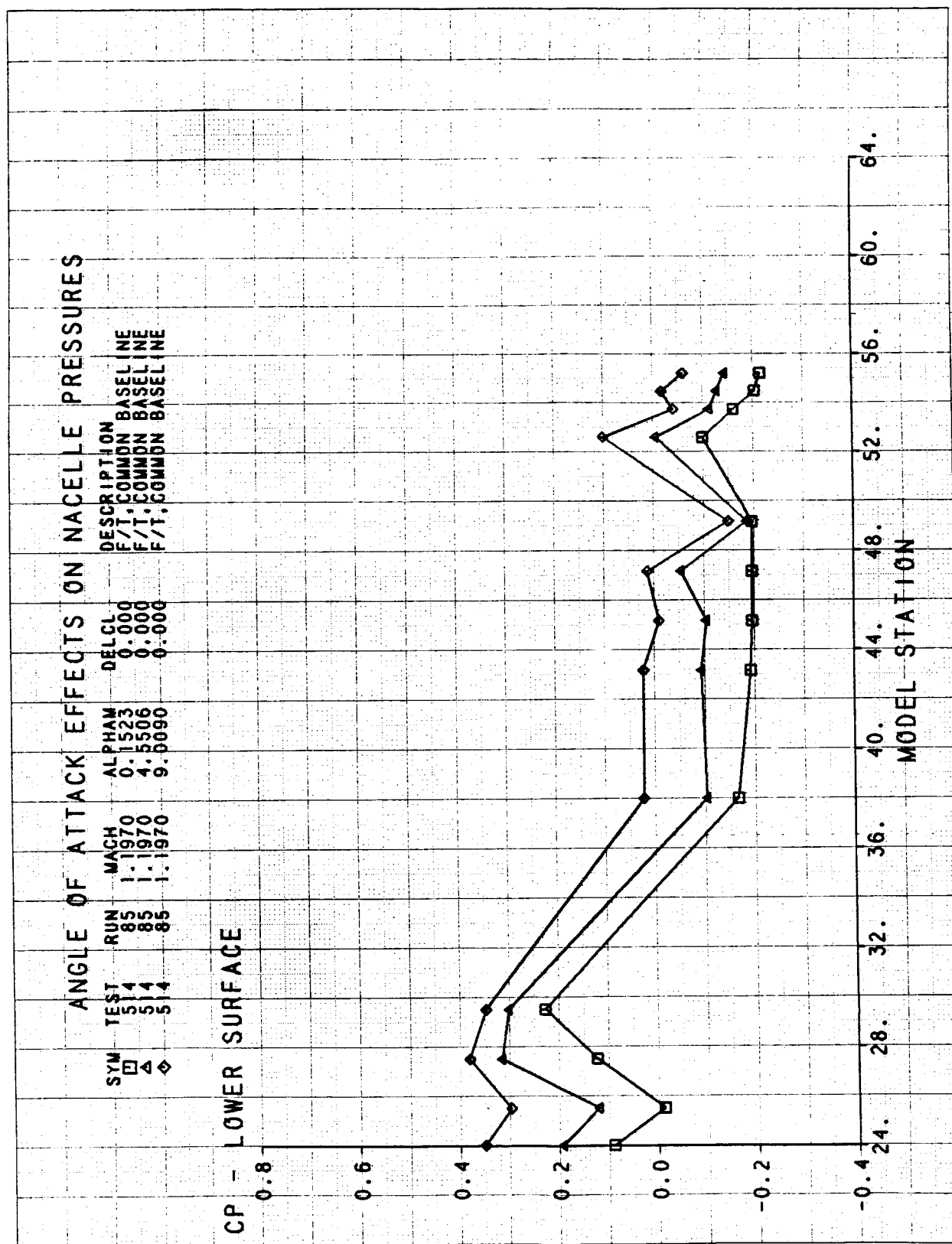


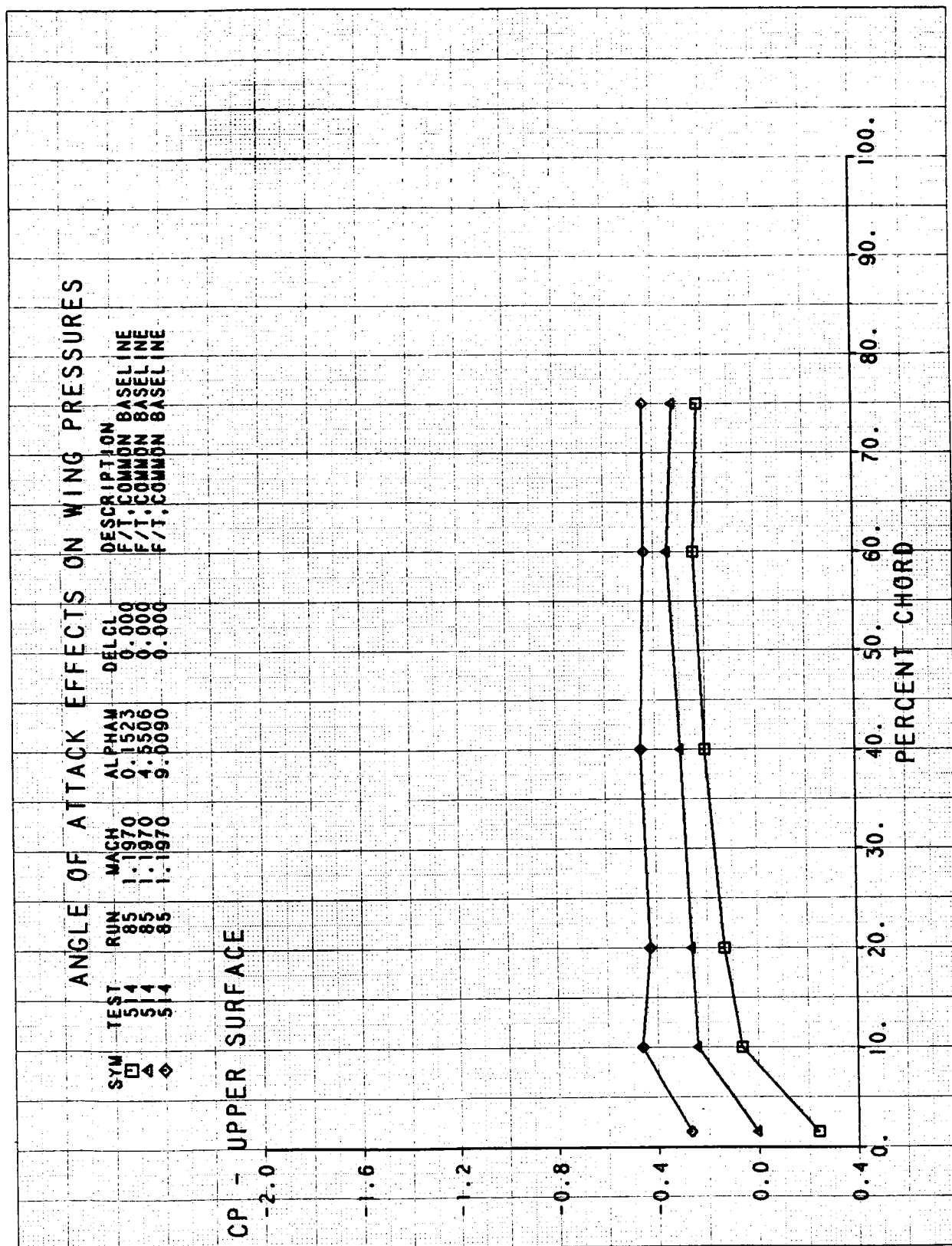


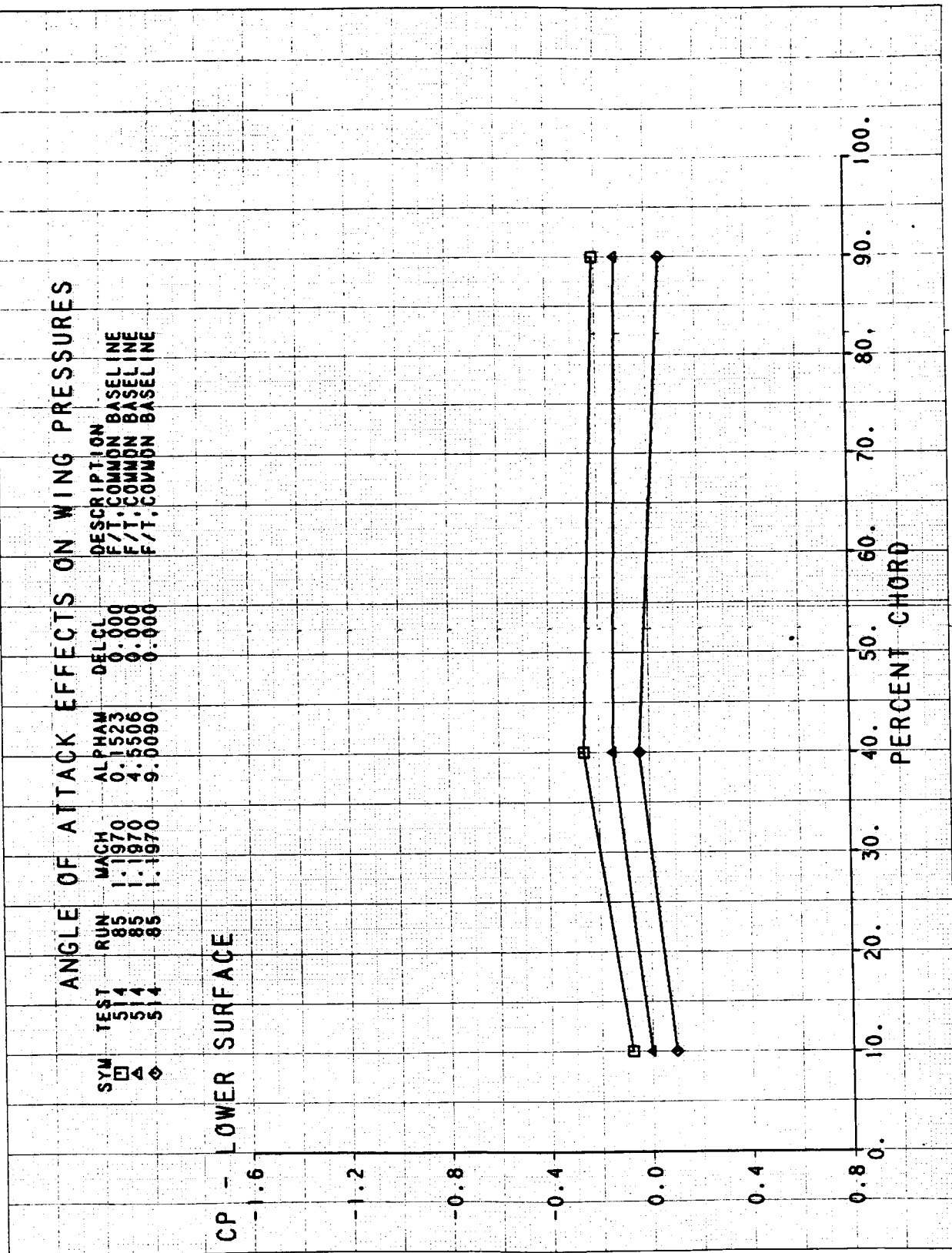


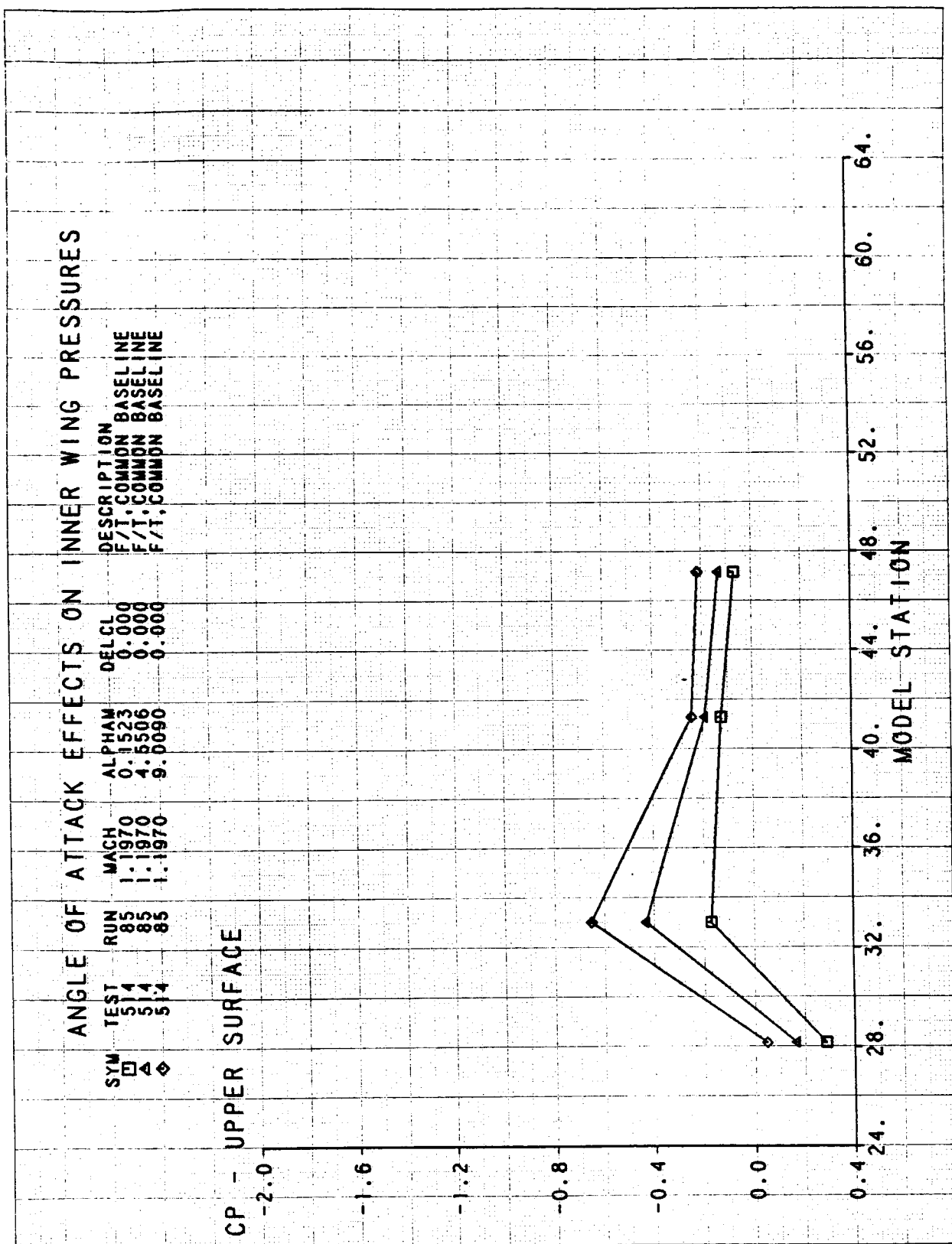


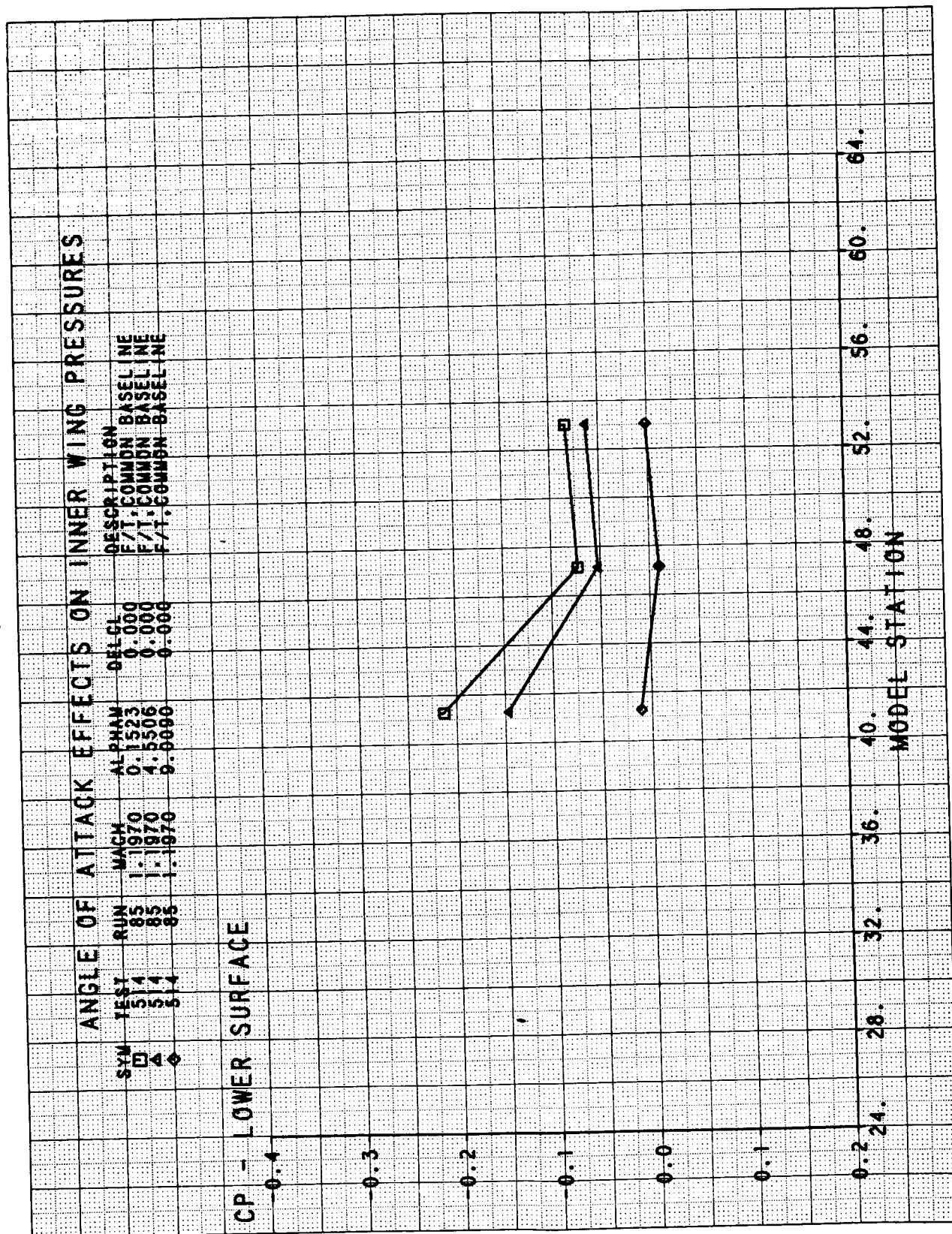


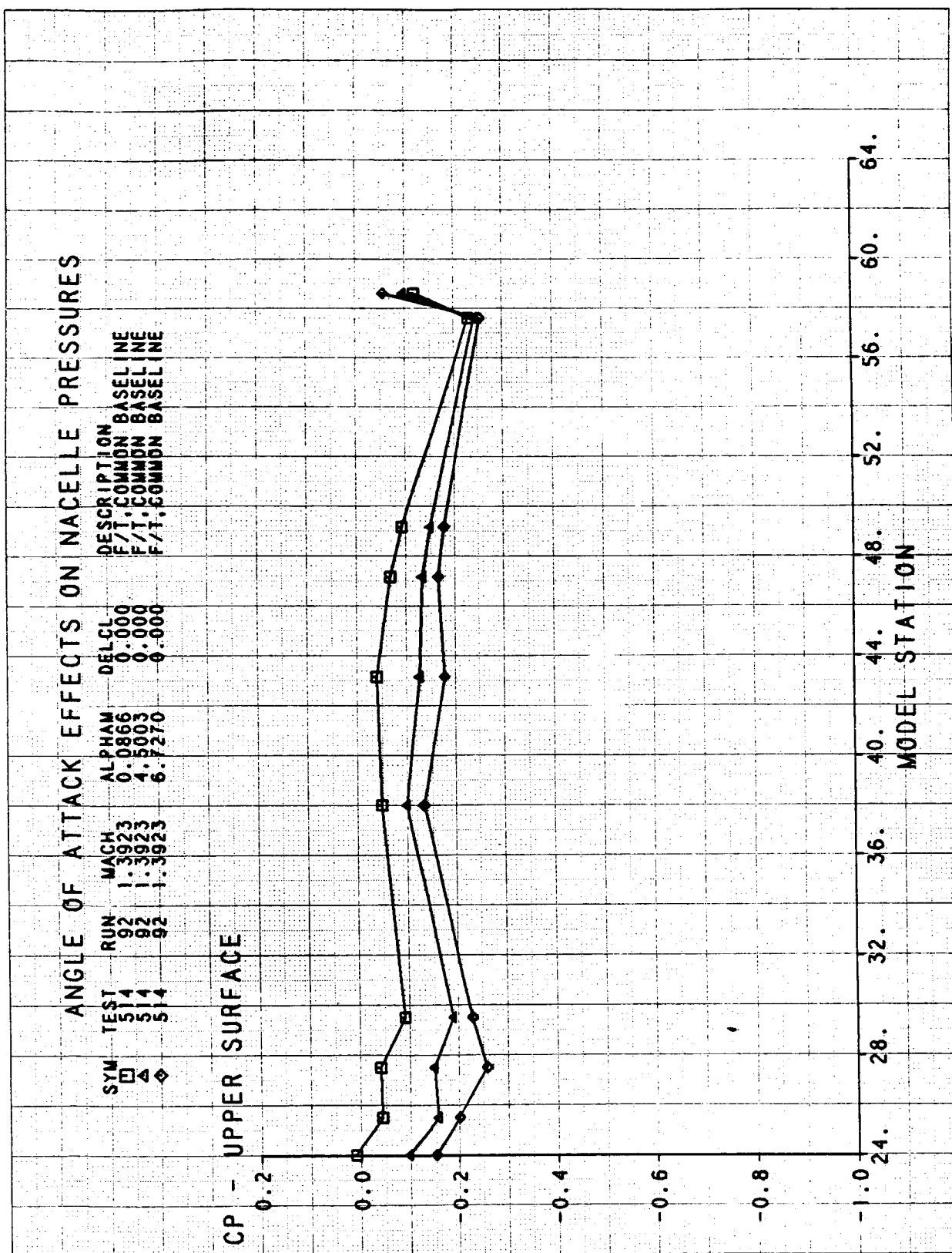


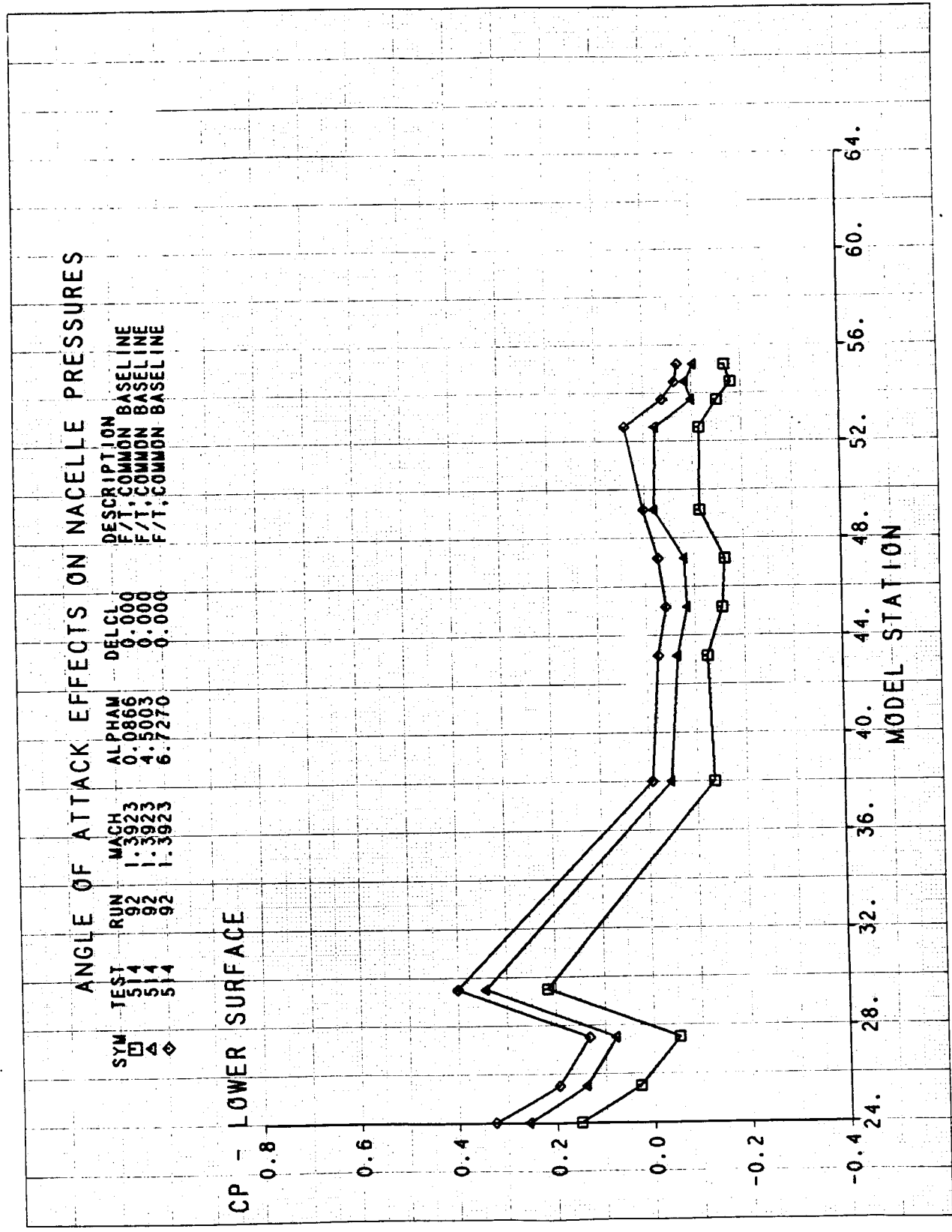


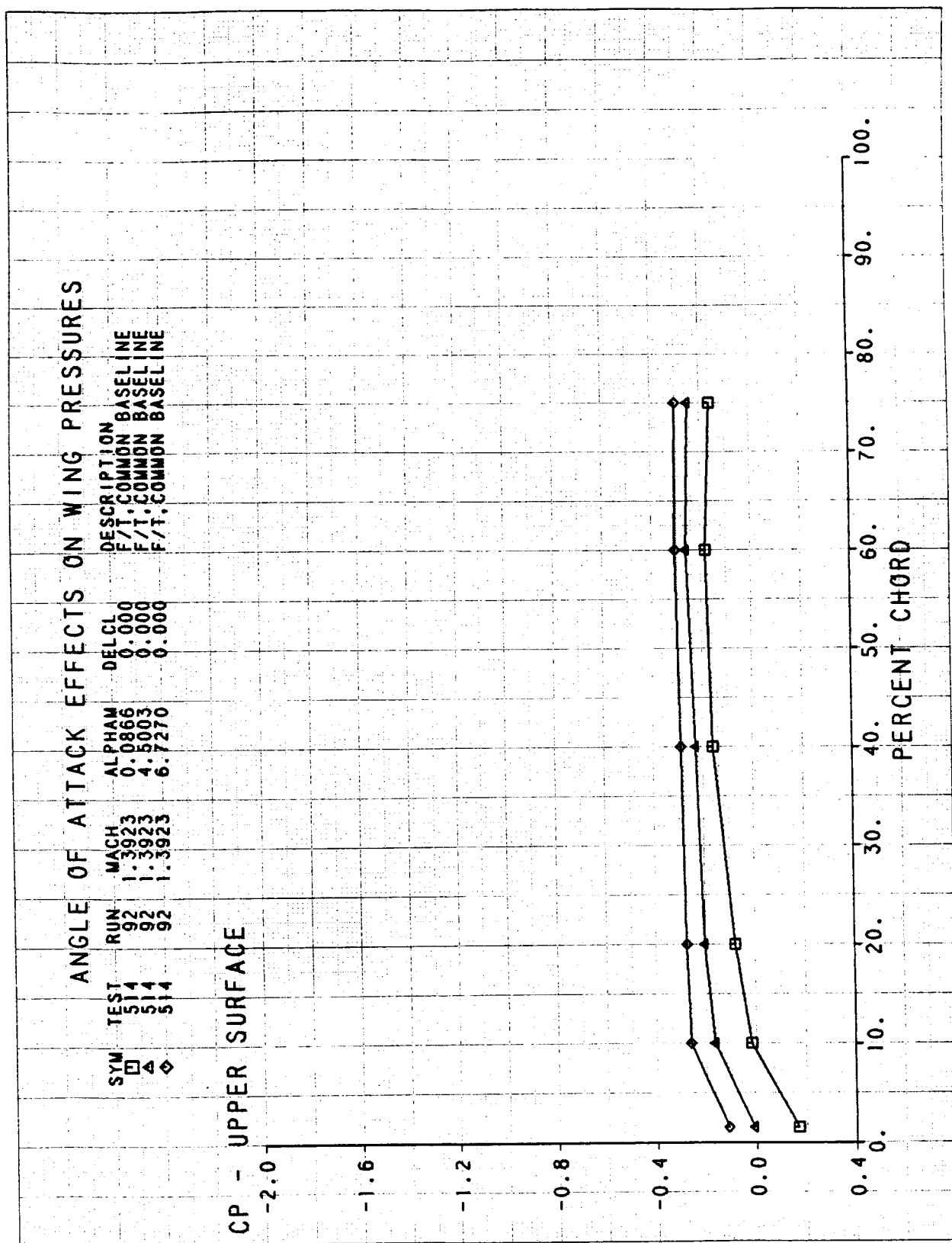




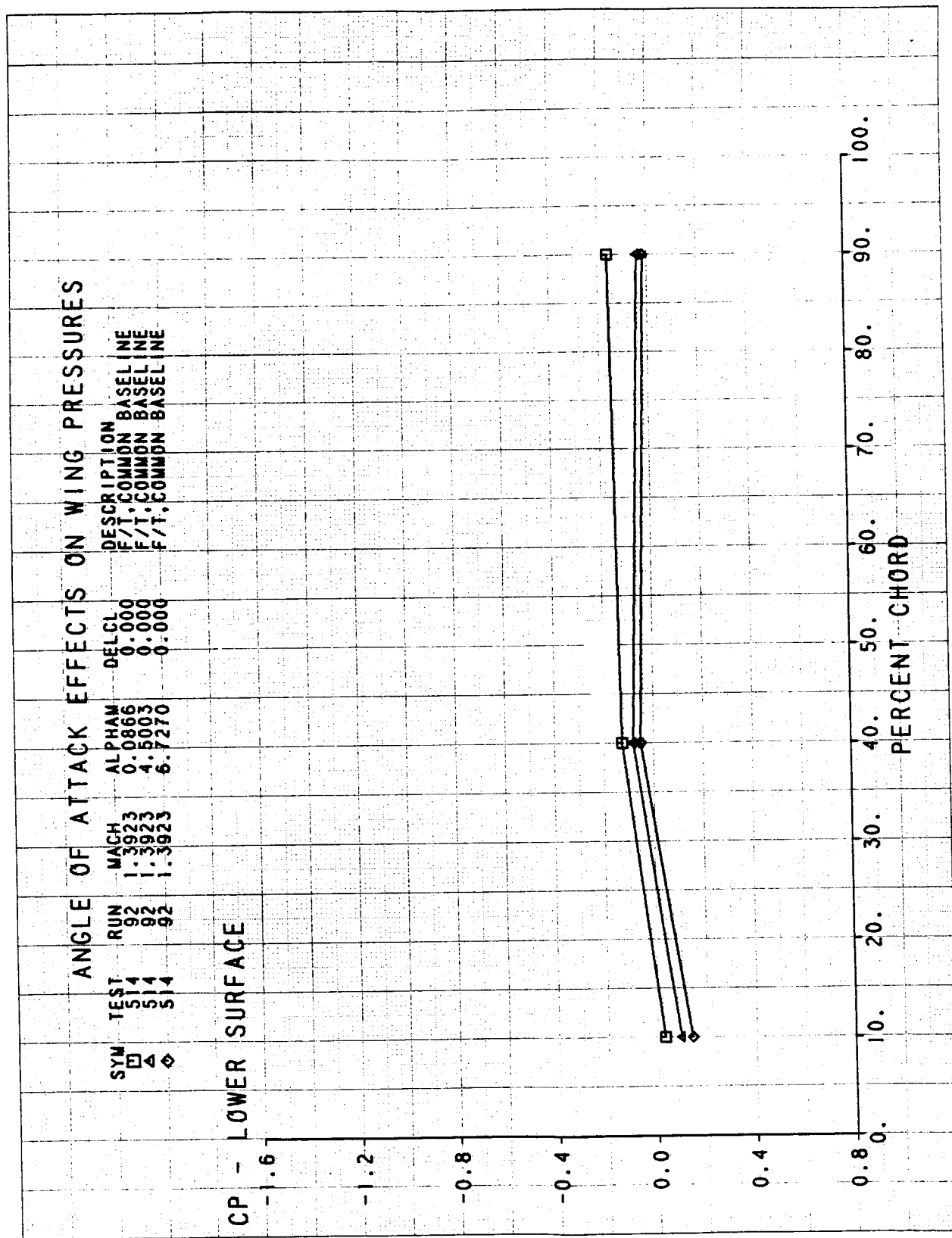








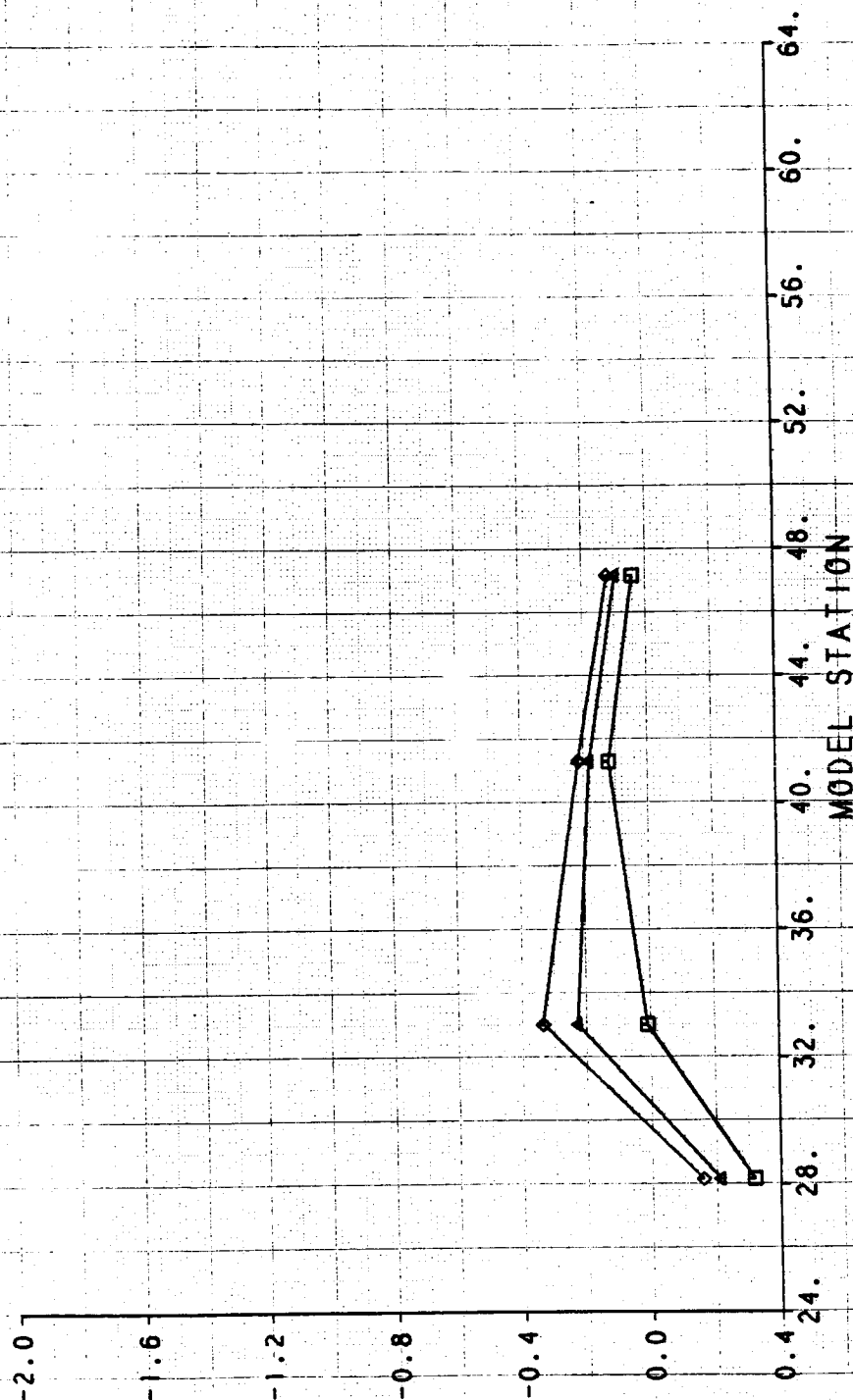


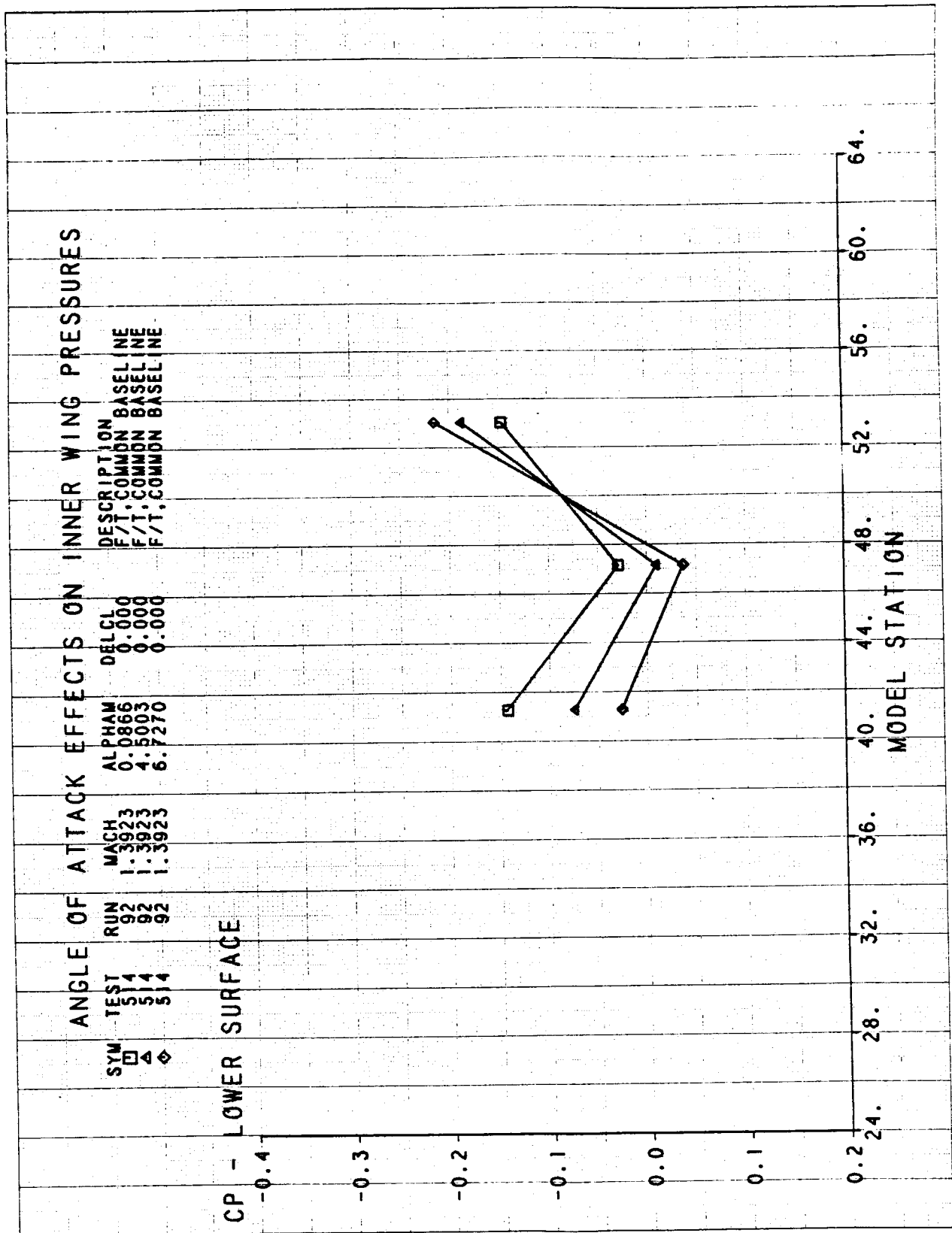


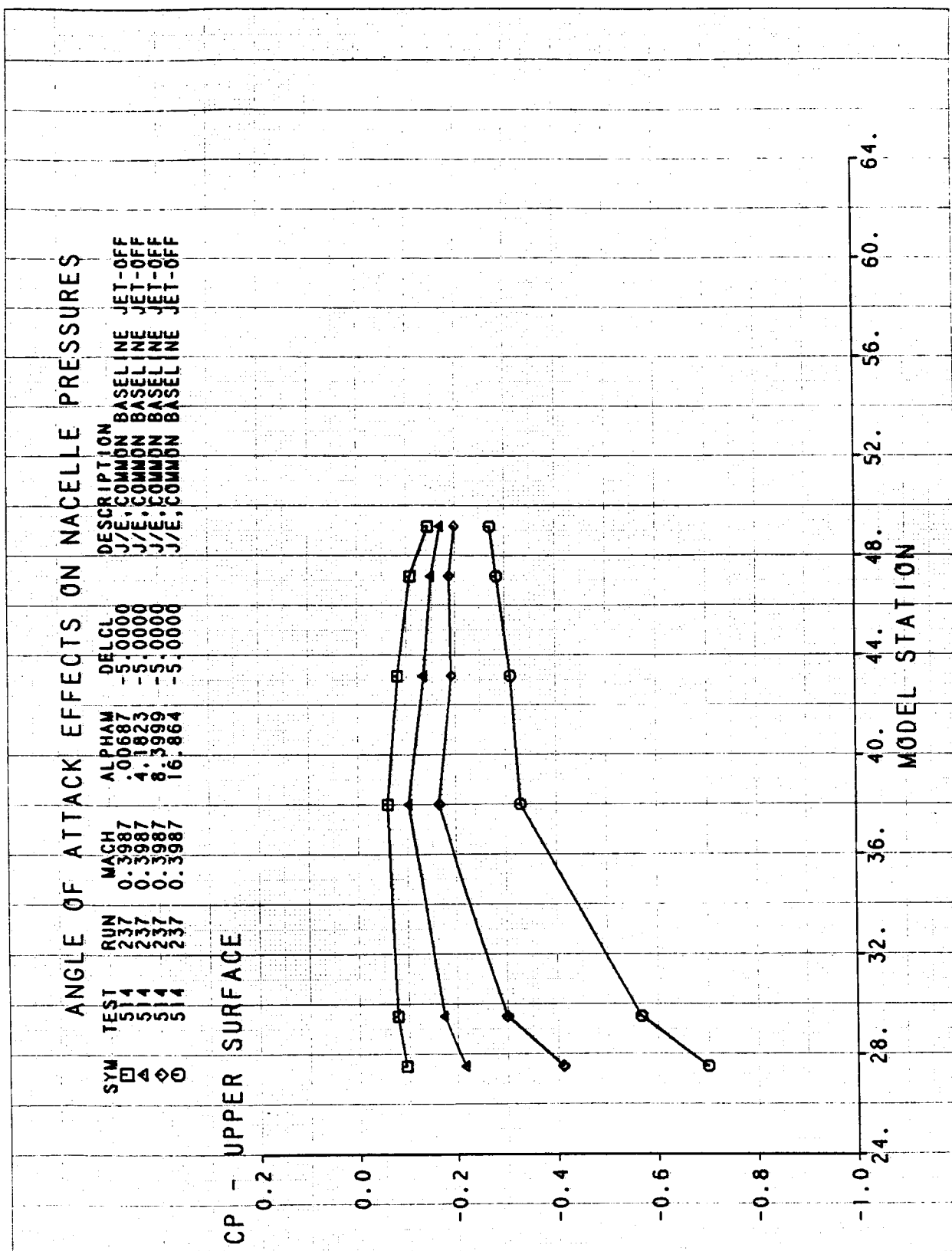
# ANGLE OF ATTACK EFFECTS ON INNER WING PRESSURES

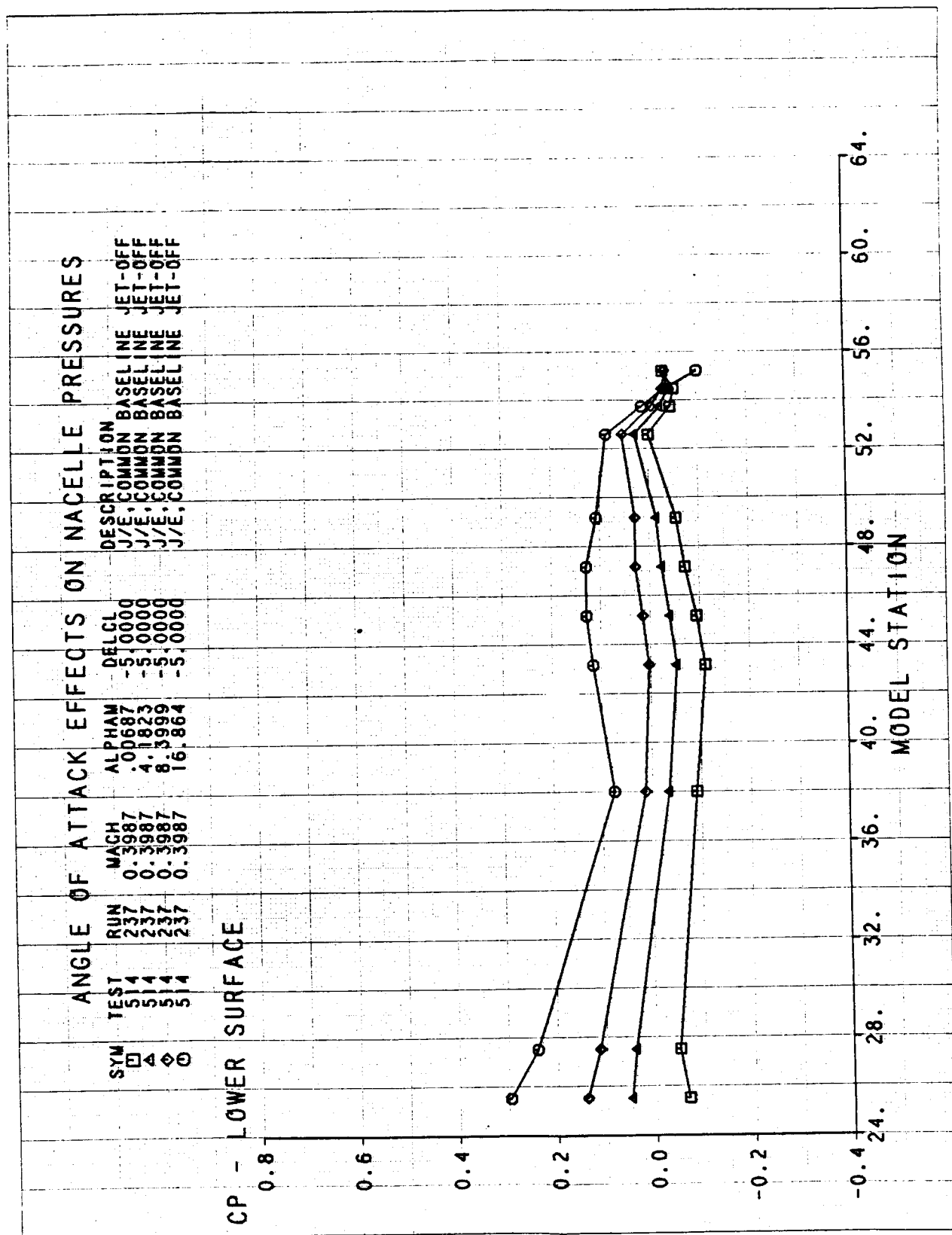
SYM	TEST	RUN	MACH	ALPHAM	DELCL	DESCRIPTION
□	514	92	1.3923	0.0866	0.000	F/T, COMMON BASELINE
△	514	92	1.3923	4.5003	0.000	F/T, COMMON BASELINE
◇	514	92	1.3923	6.7270	0.000	F/T, COMMON BASELINE

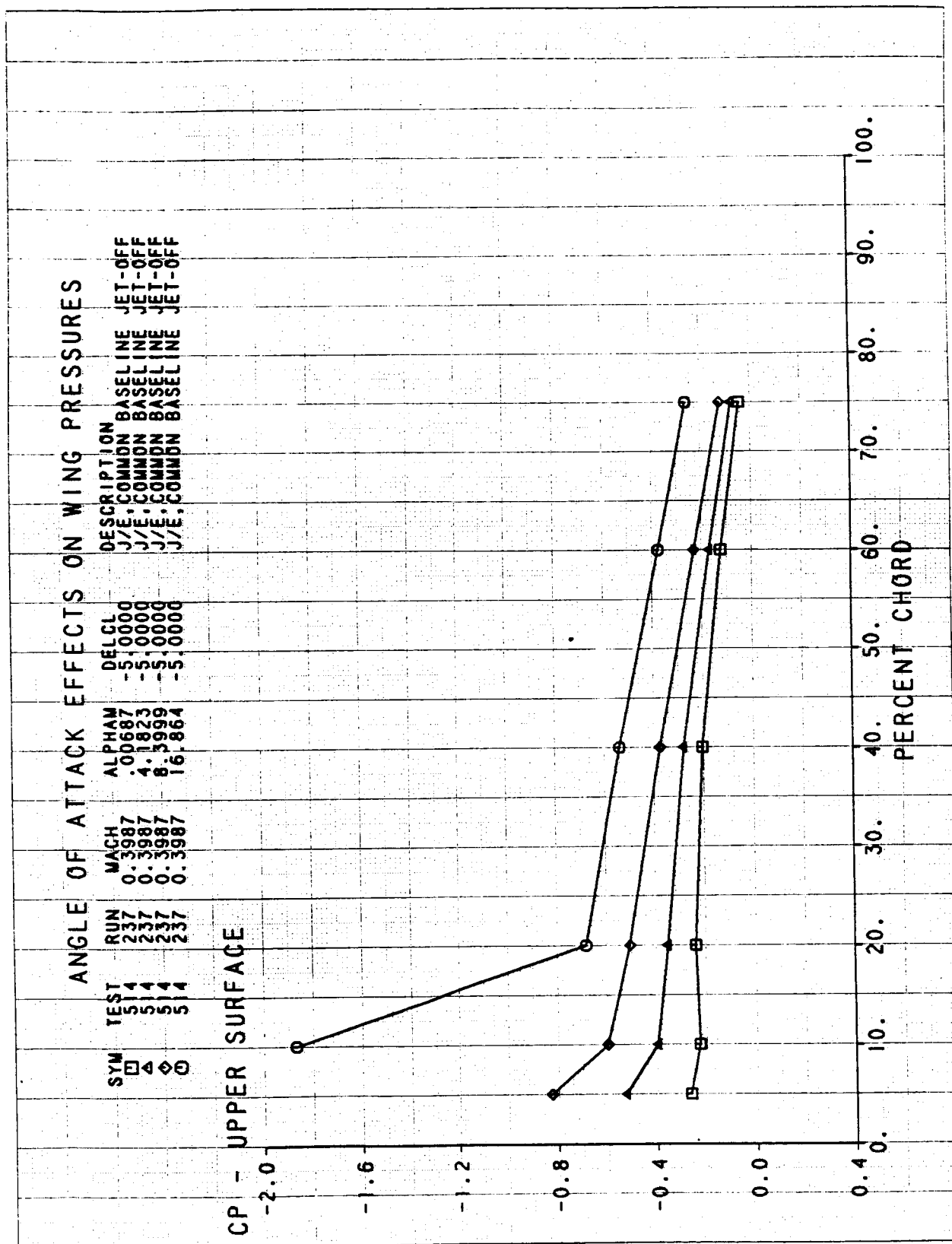
CP - UPPER SURFACE

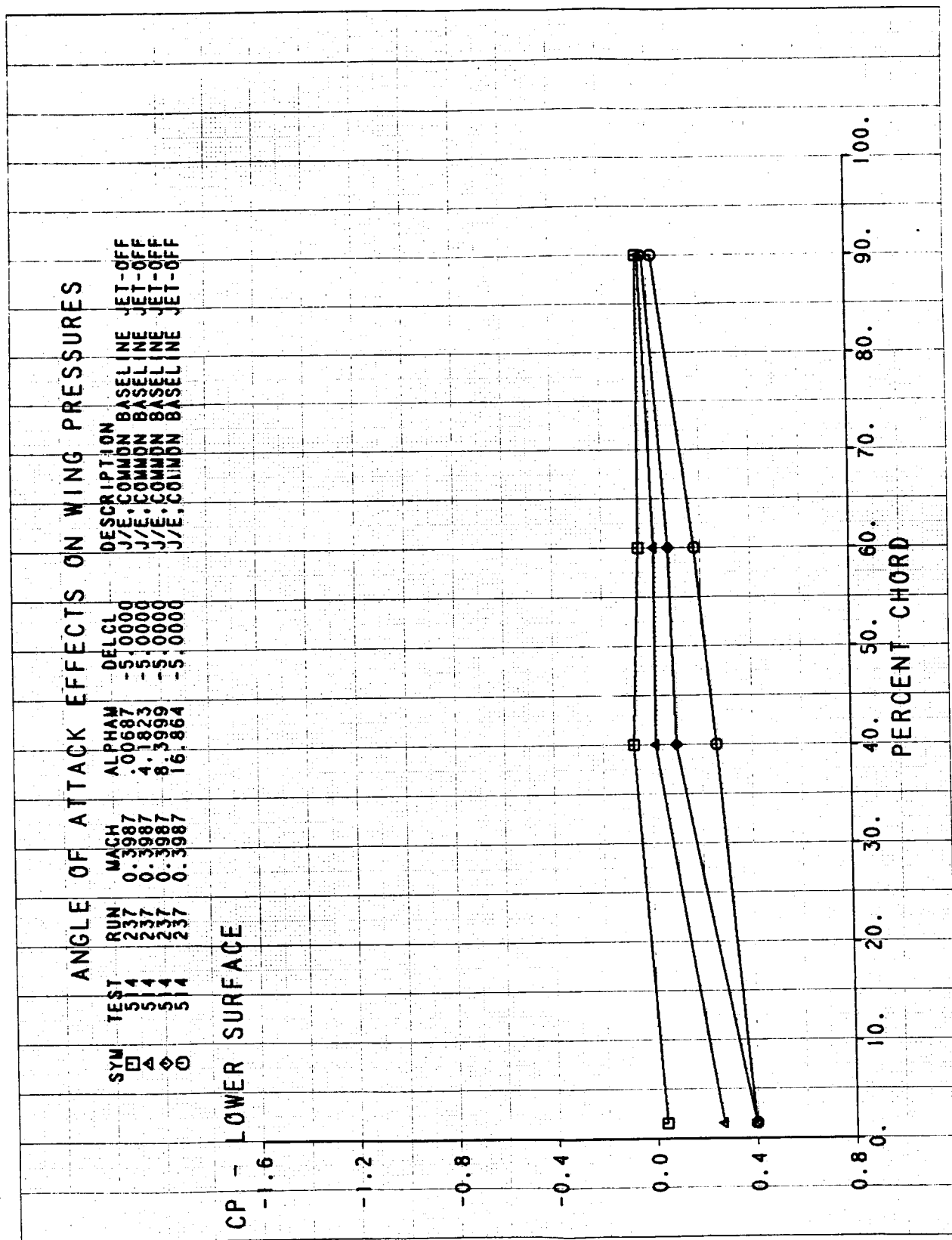


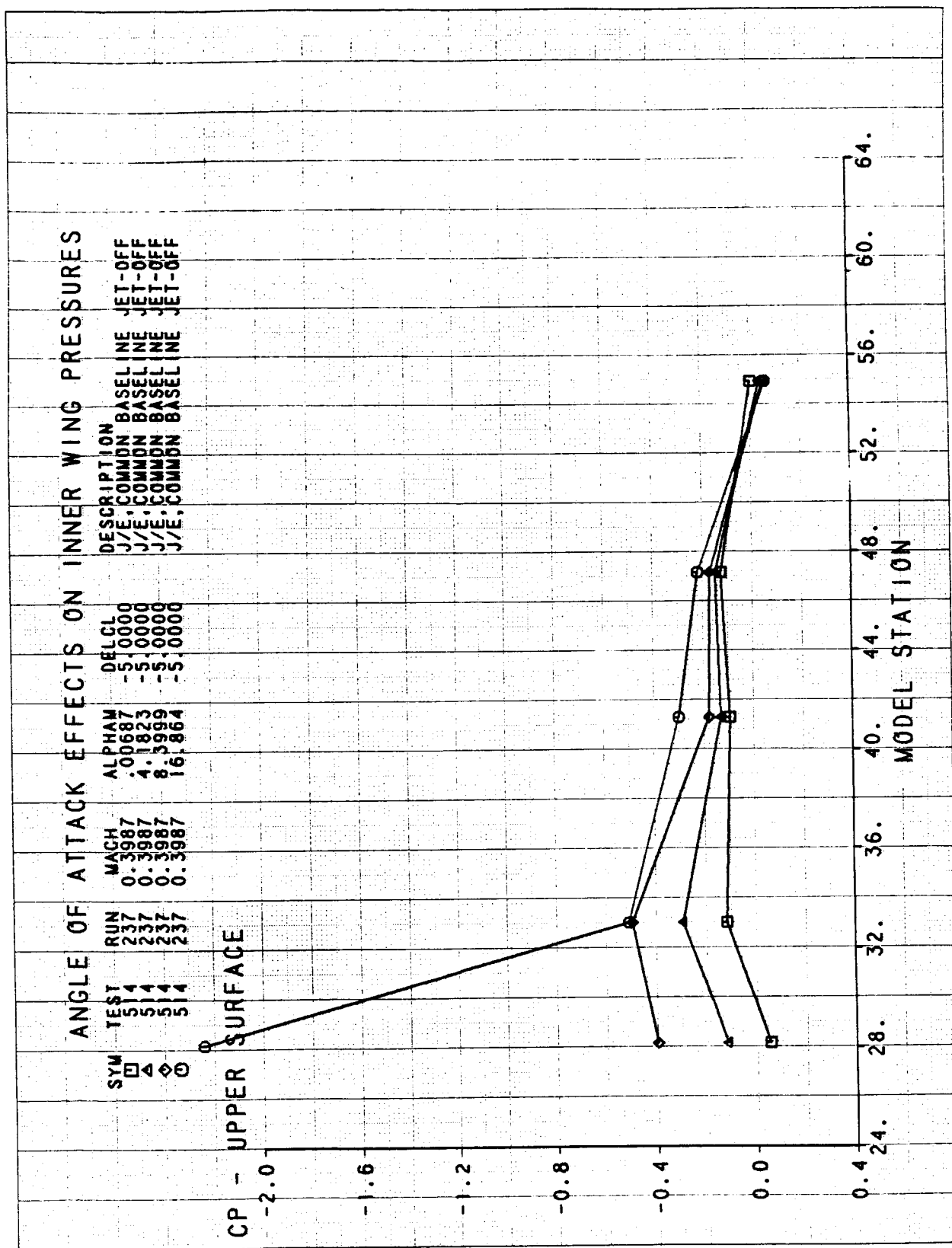




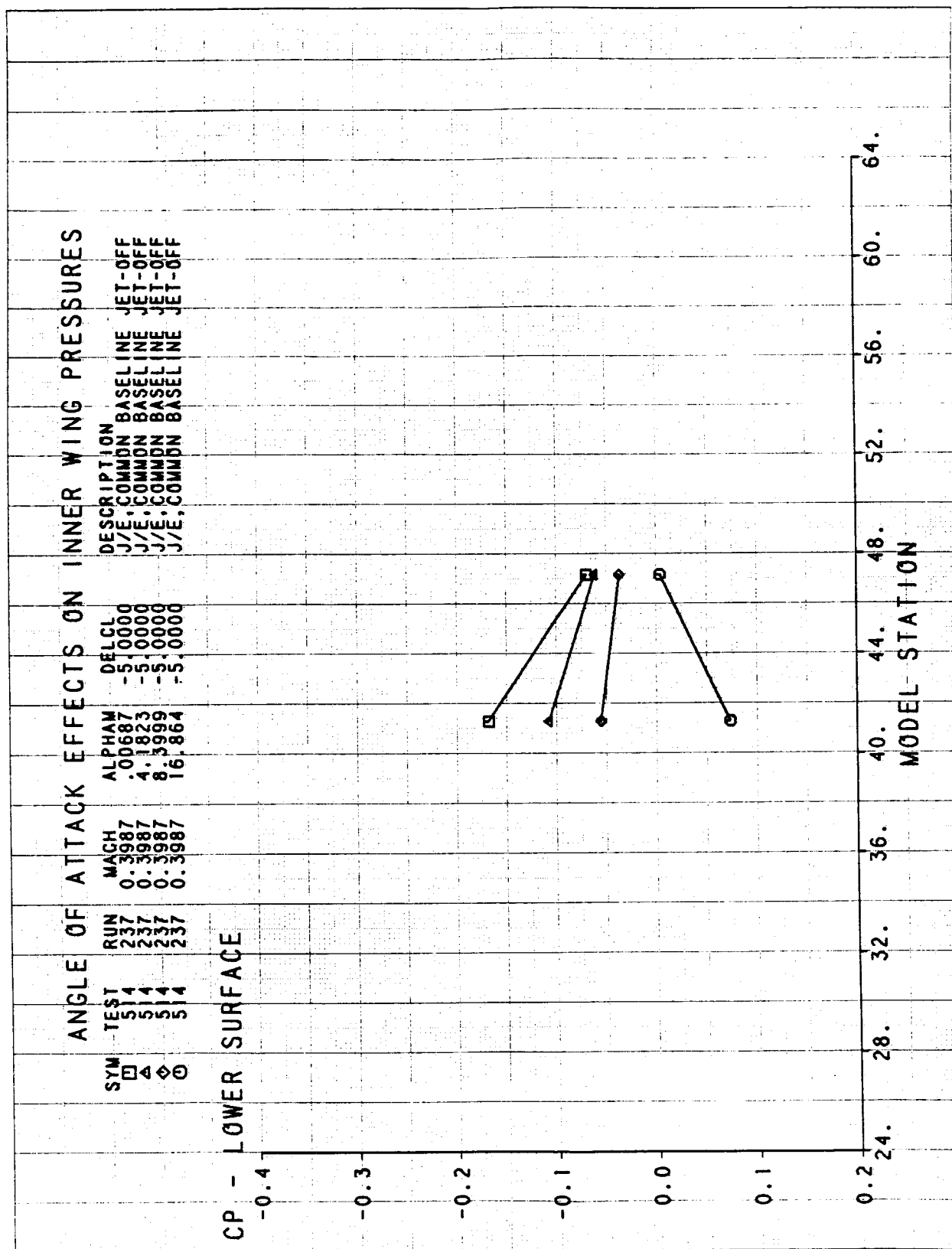


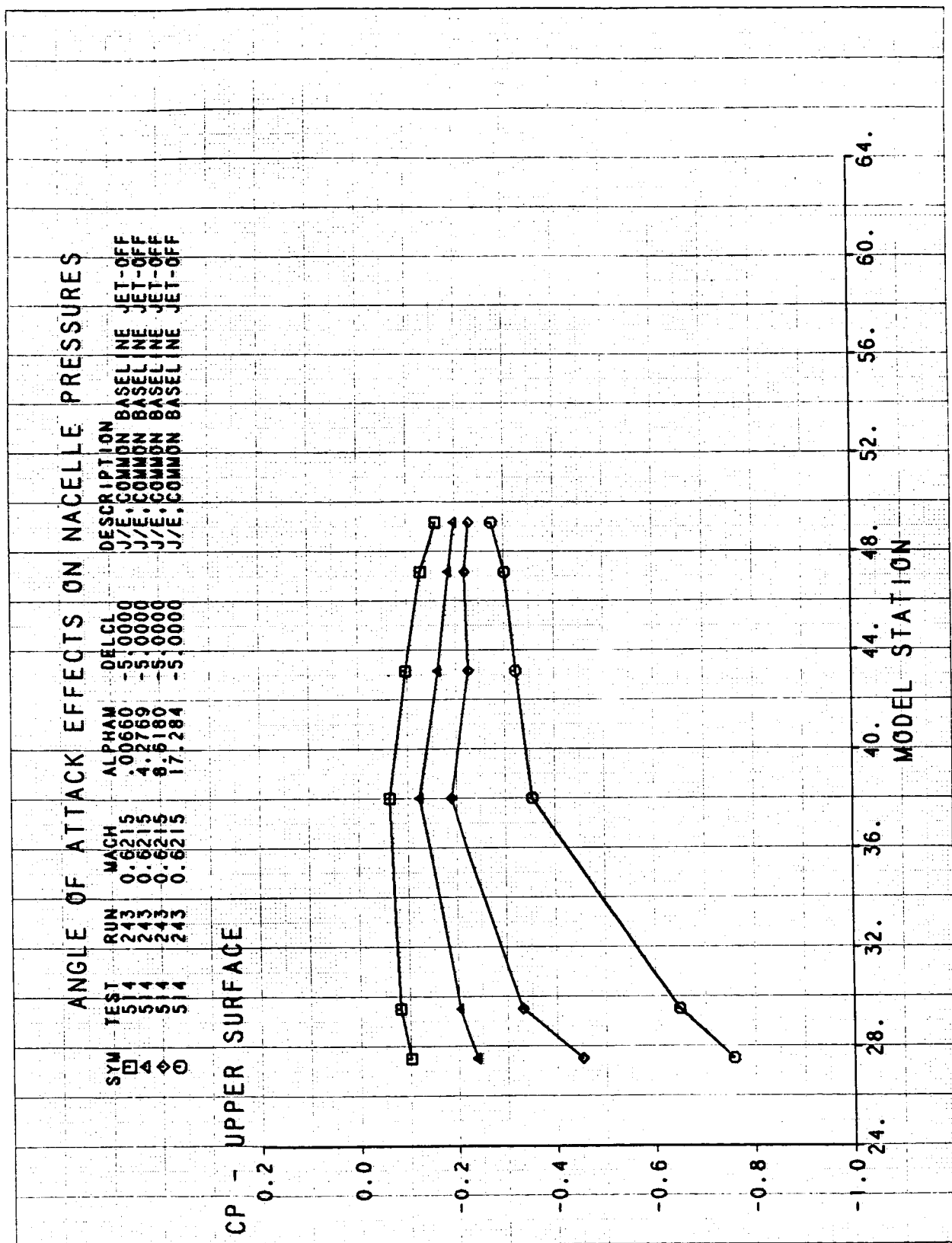


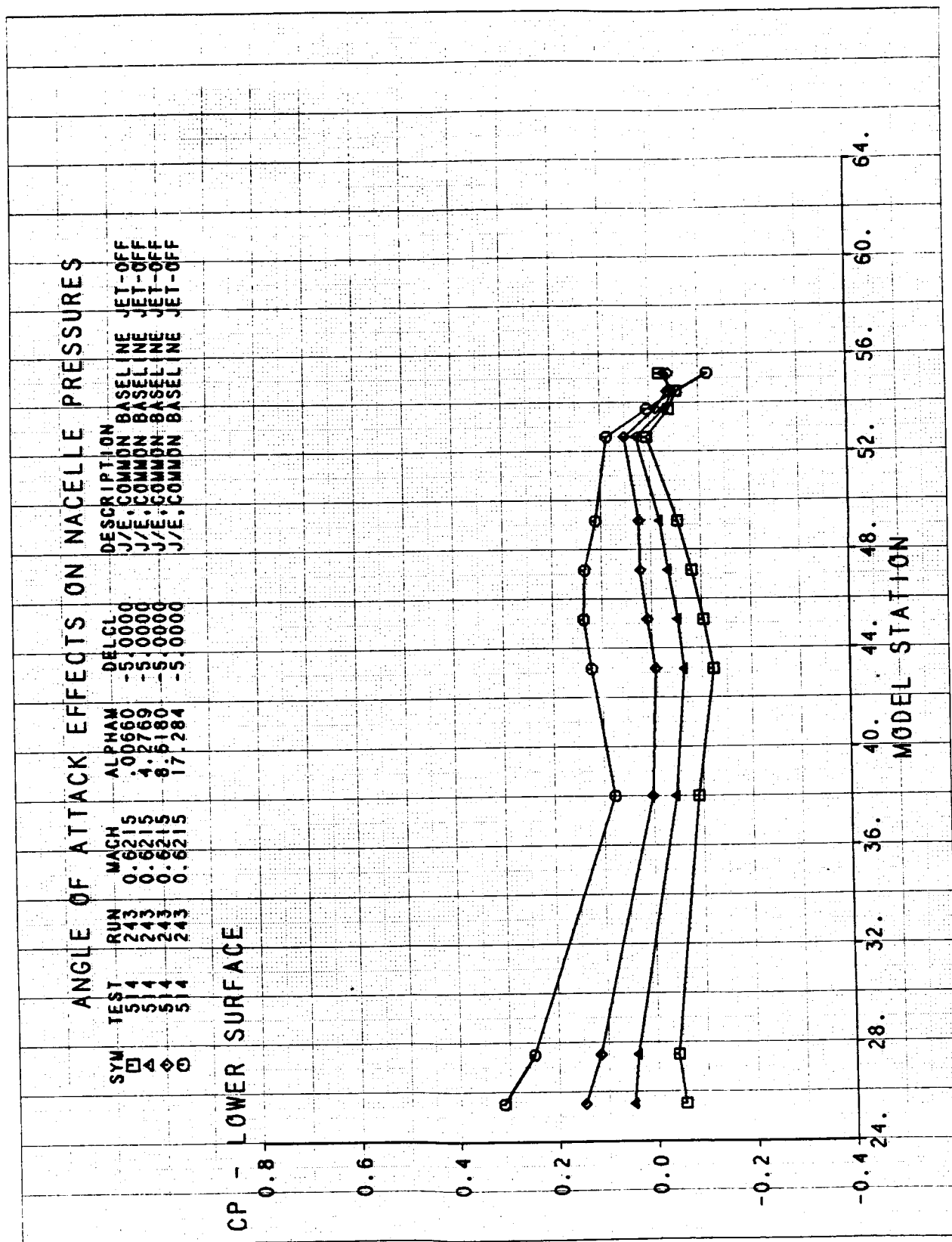


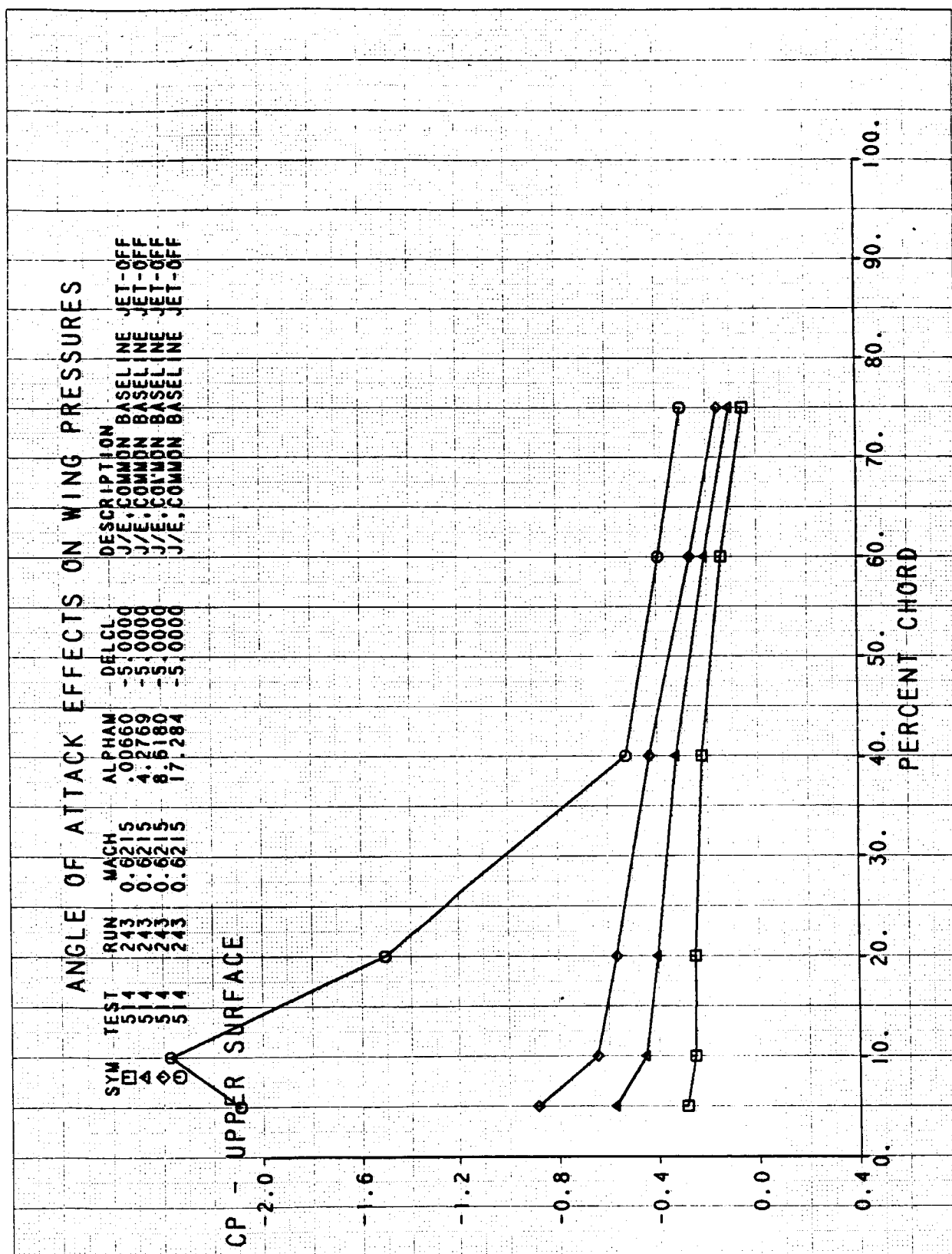


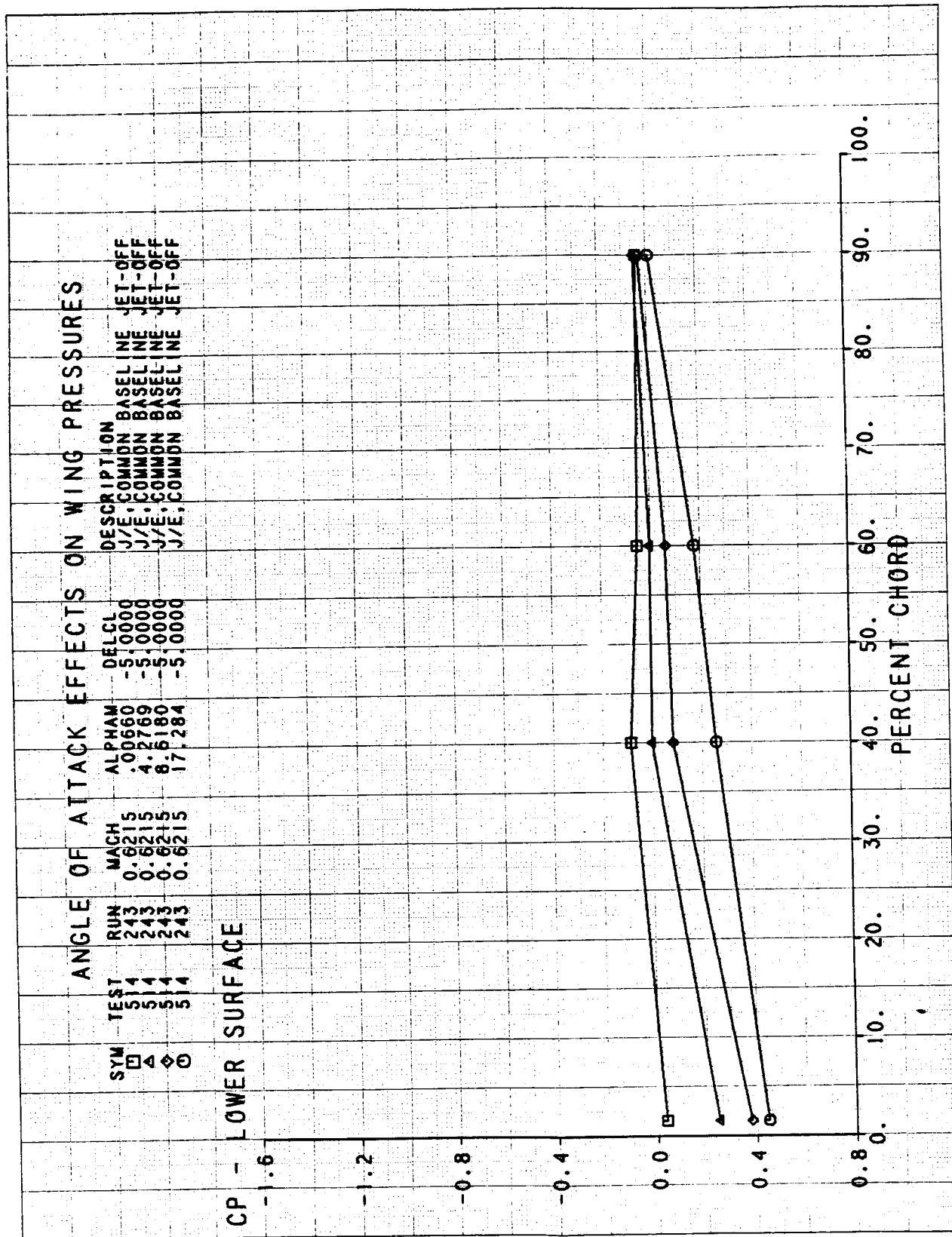


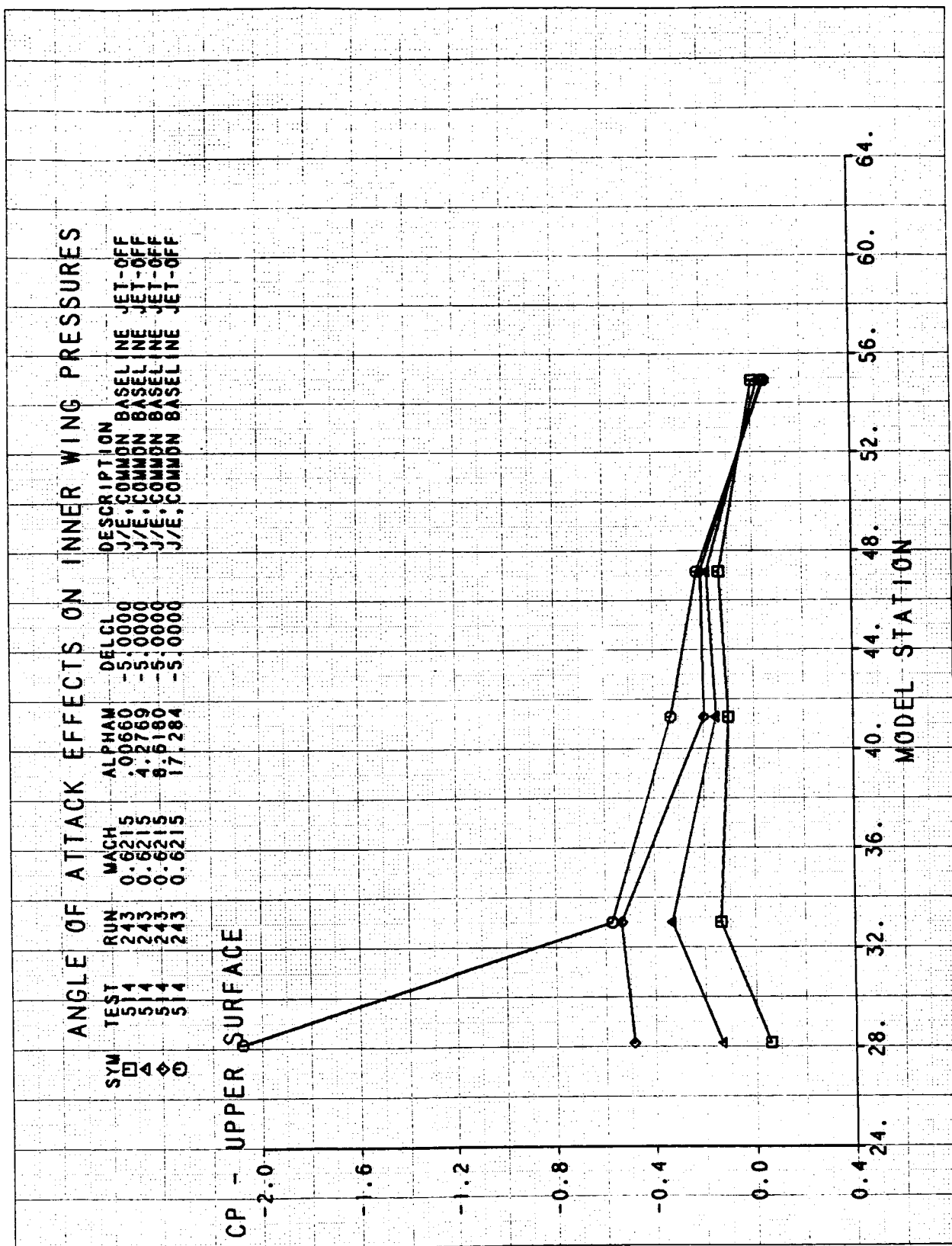


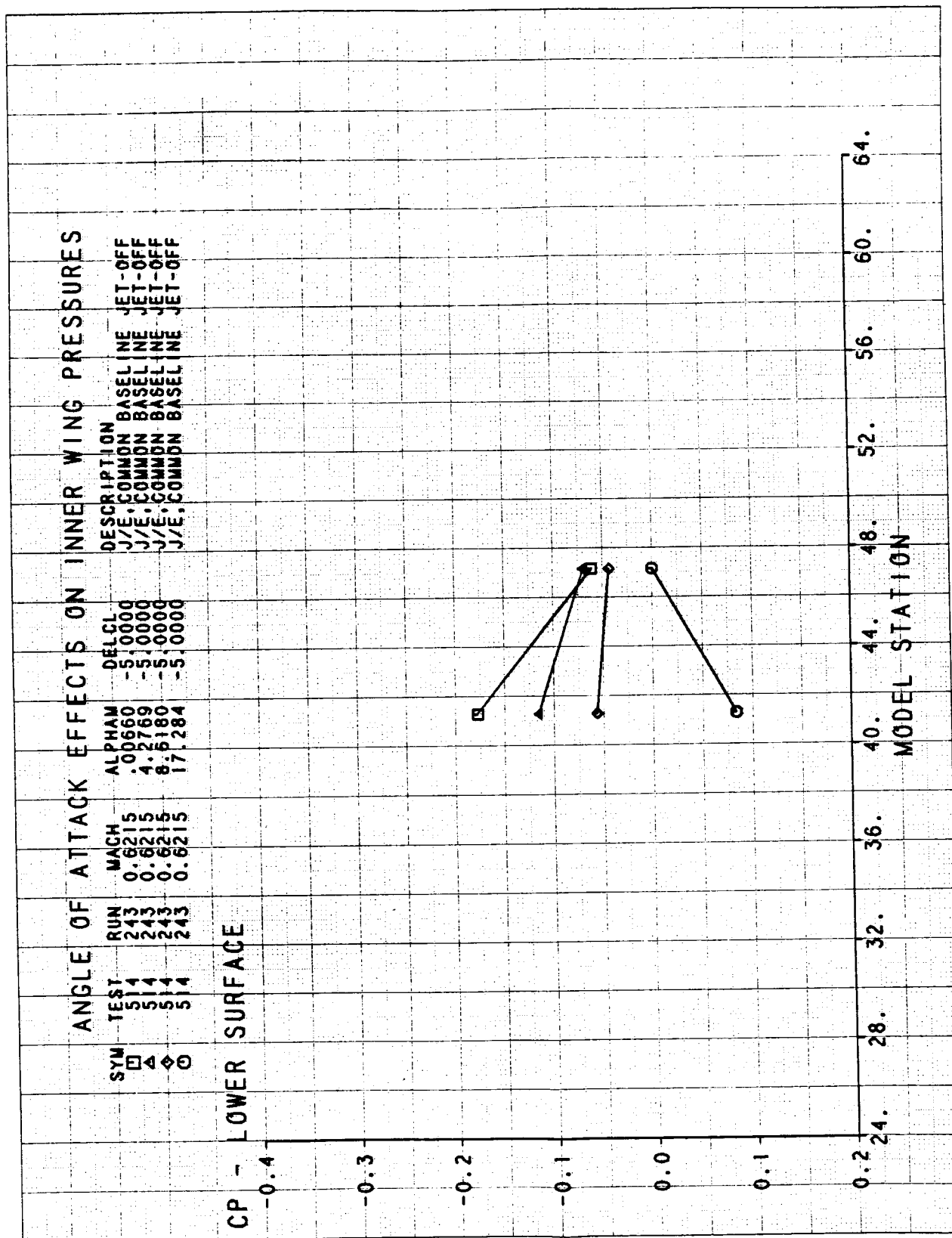


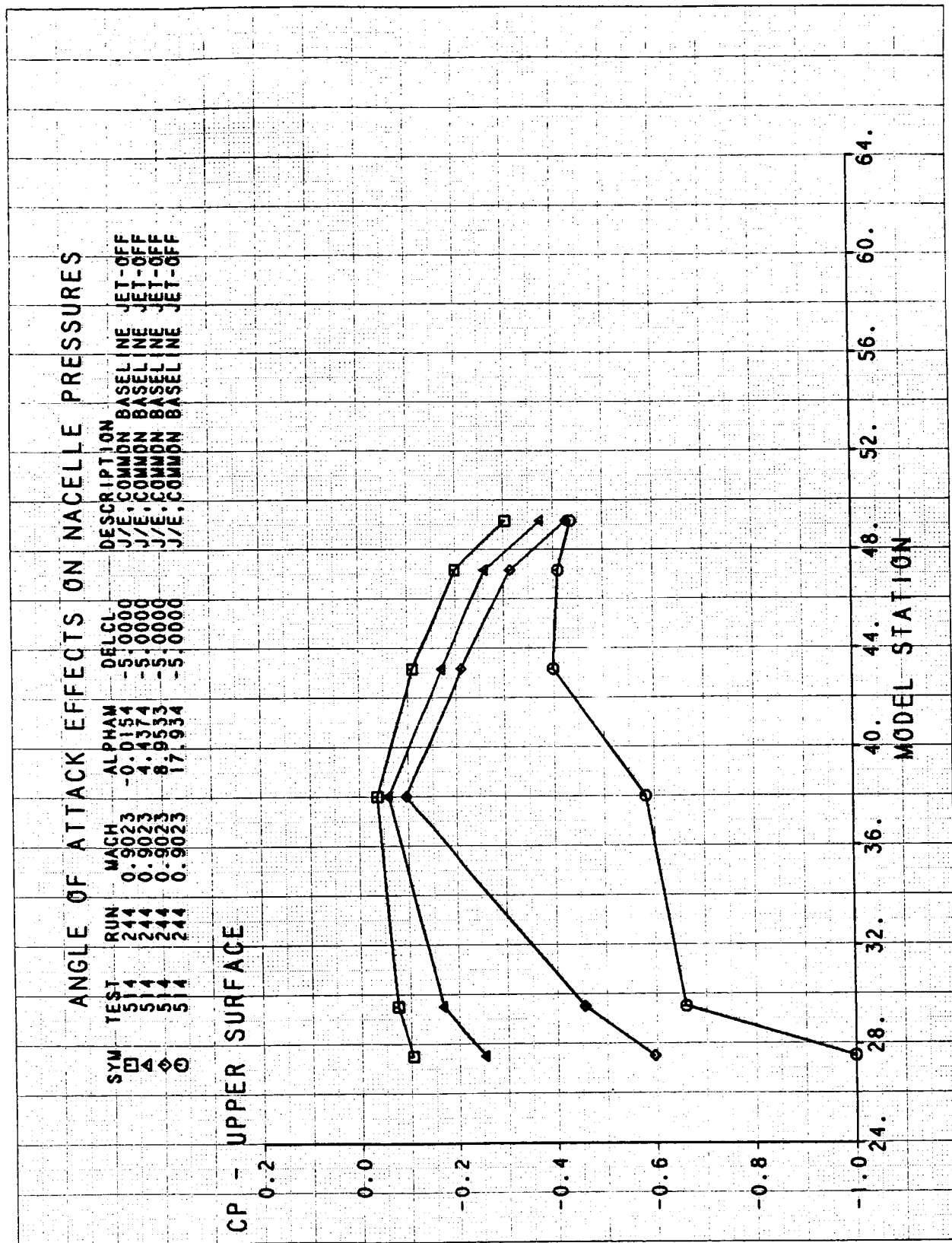




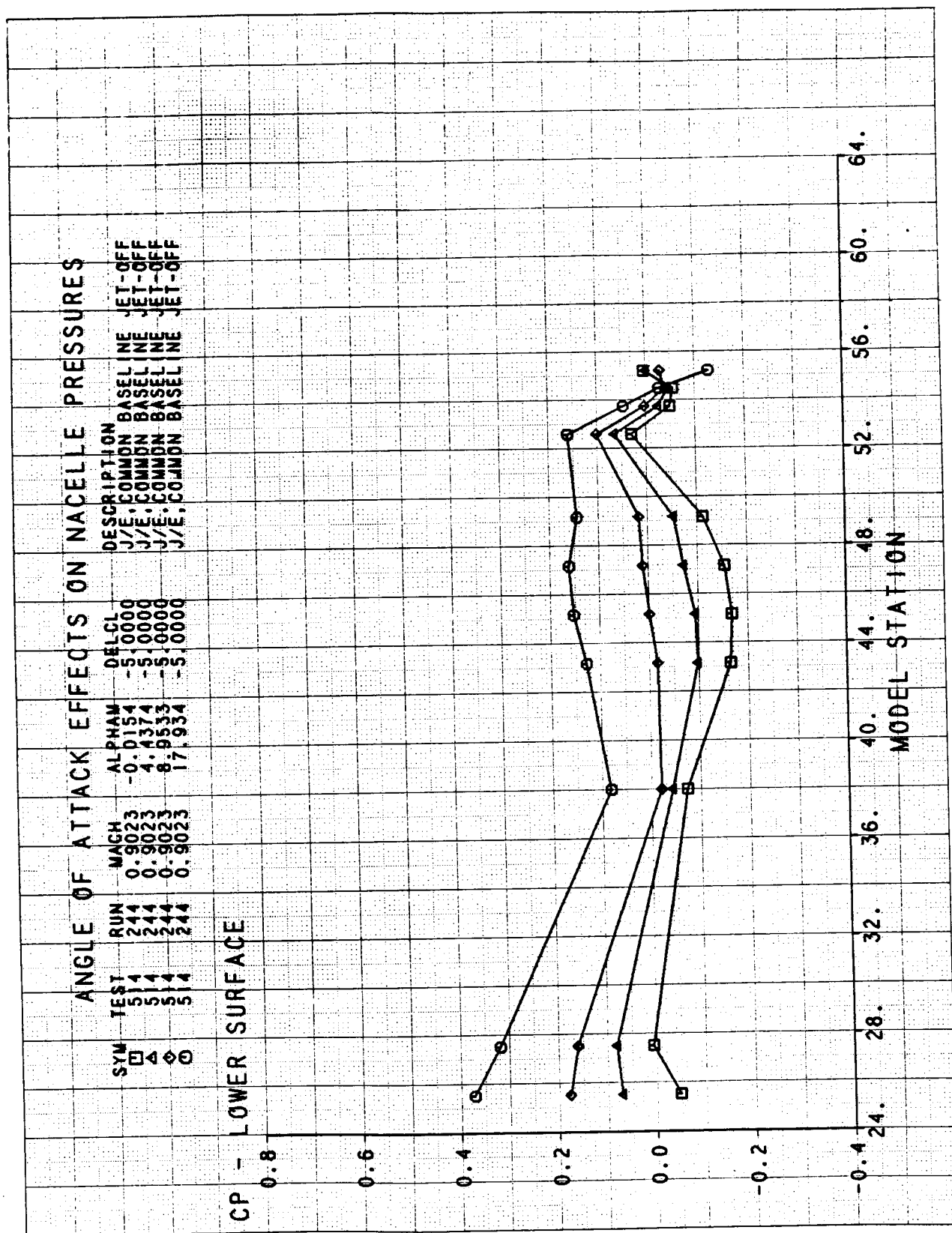


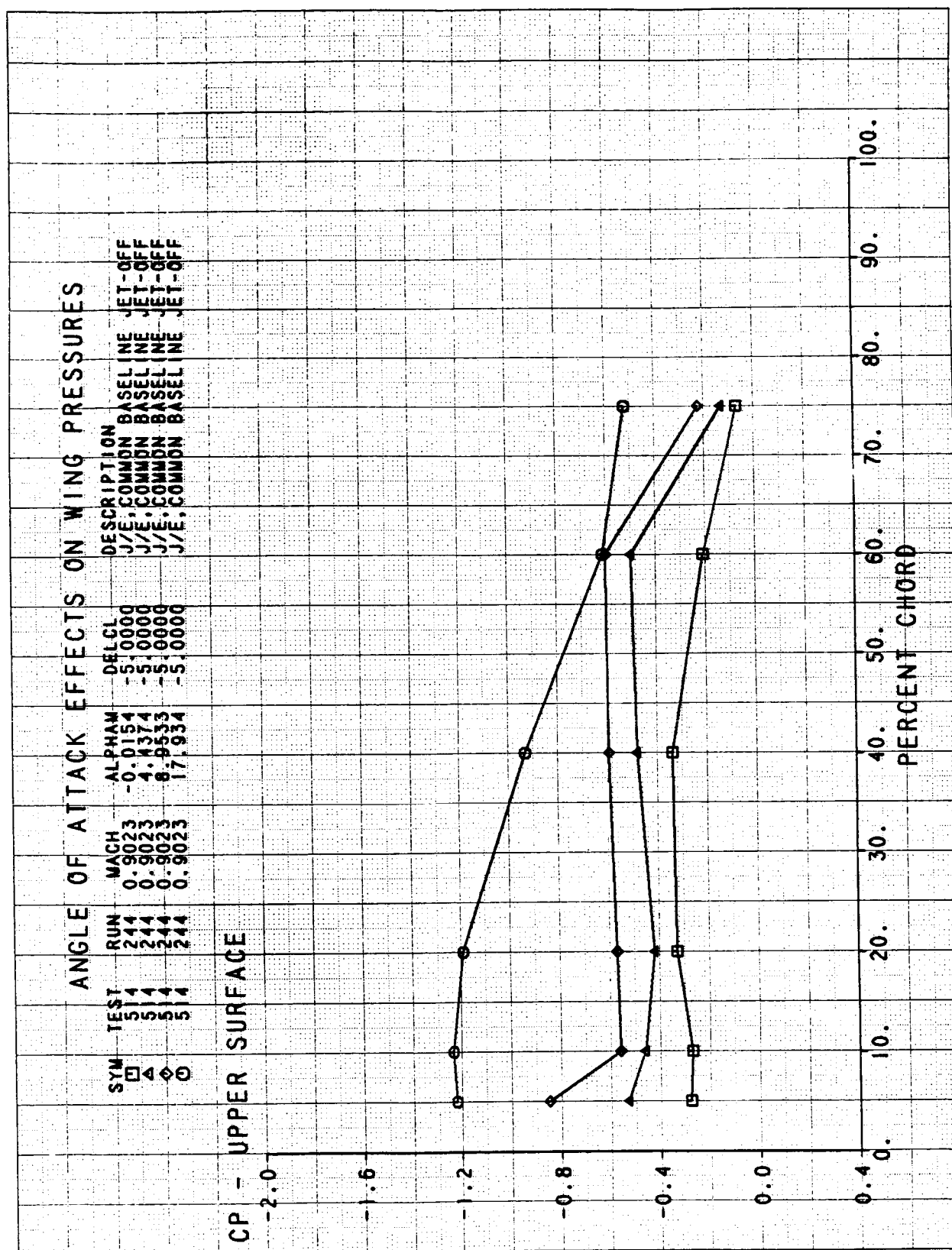


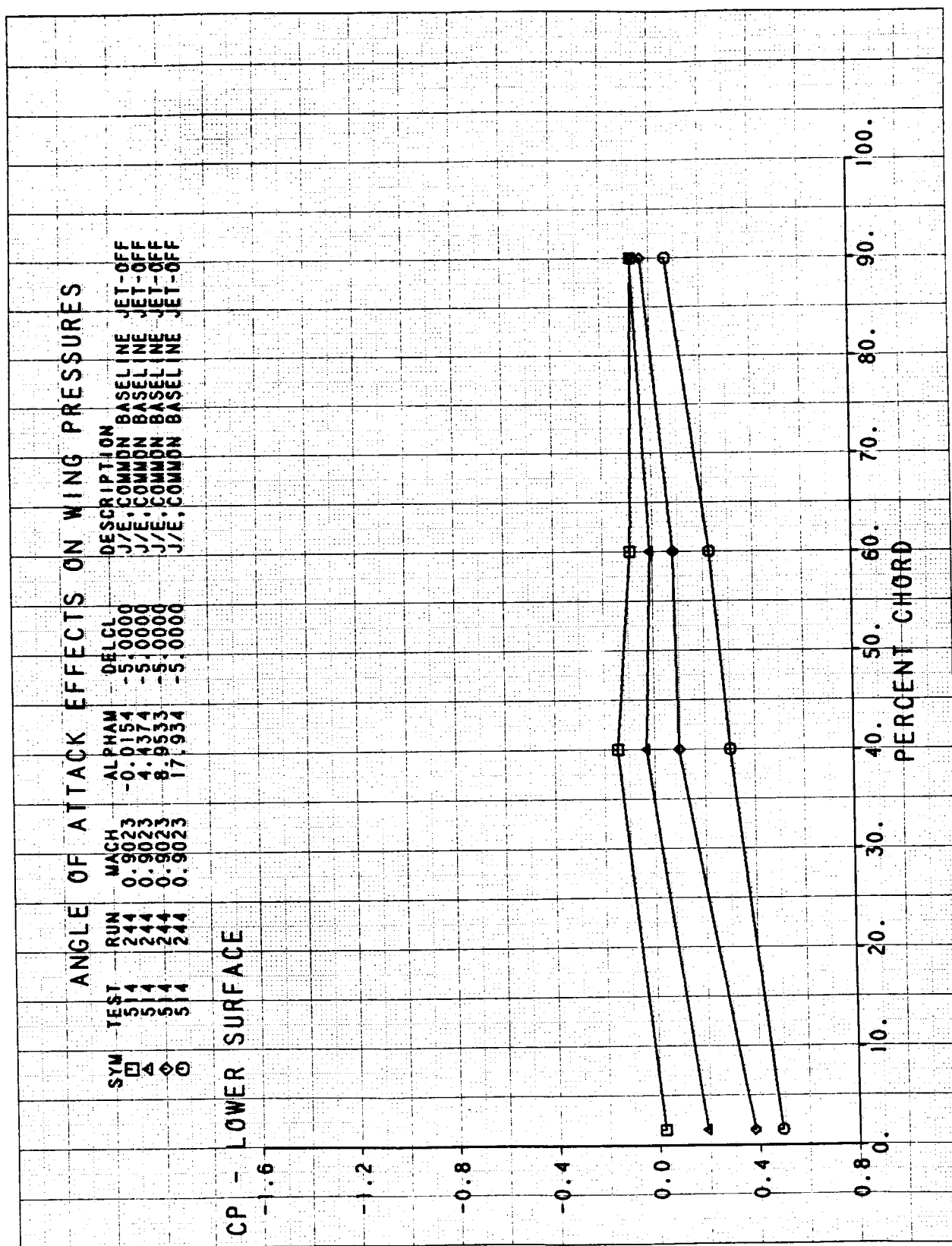


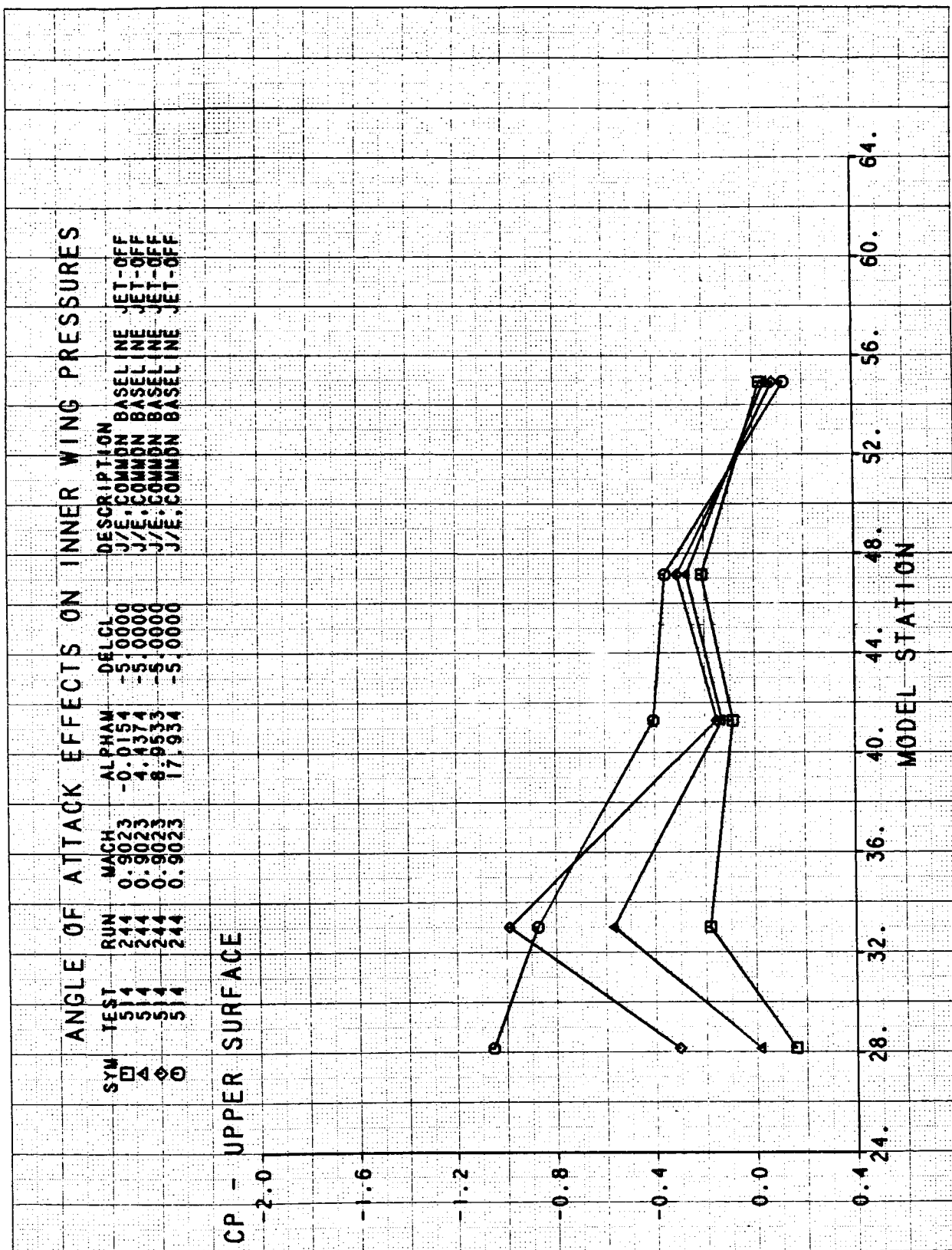




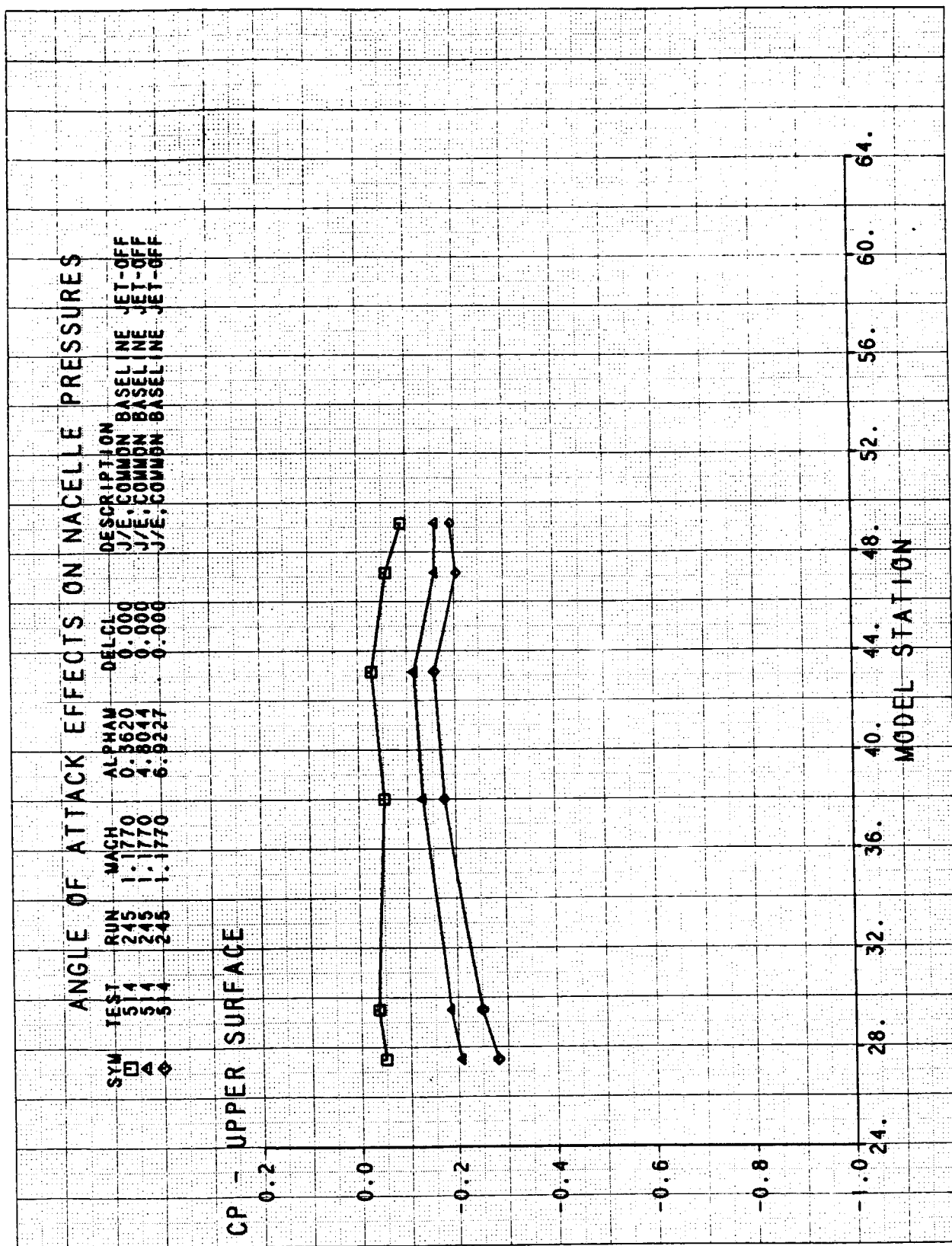


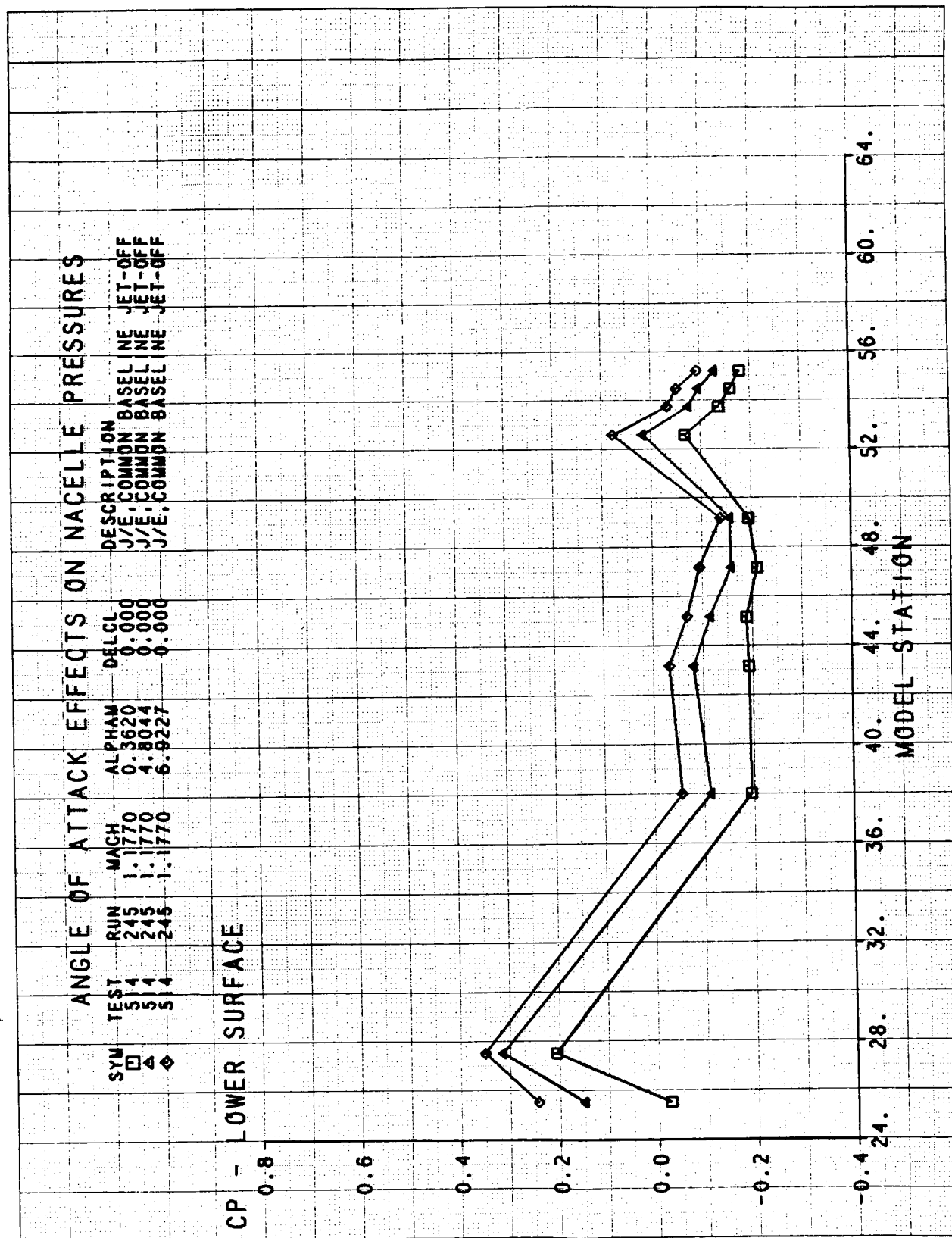


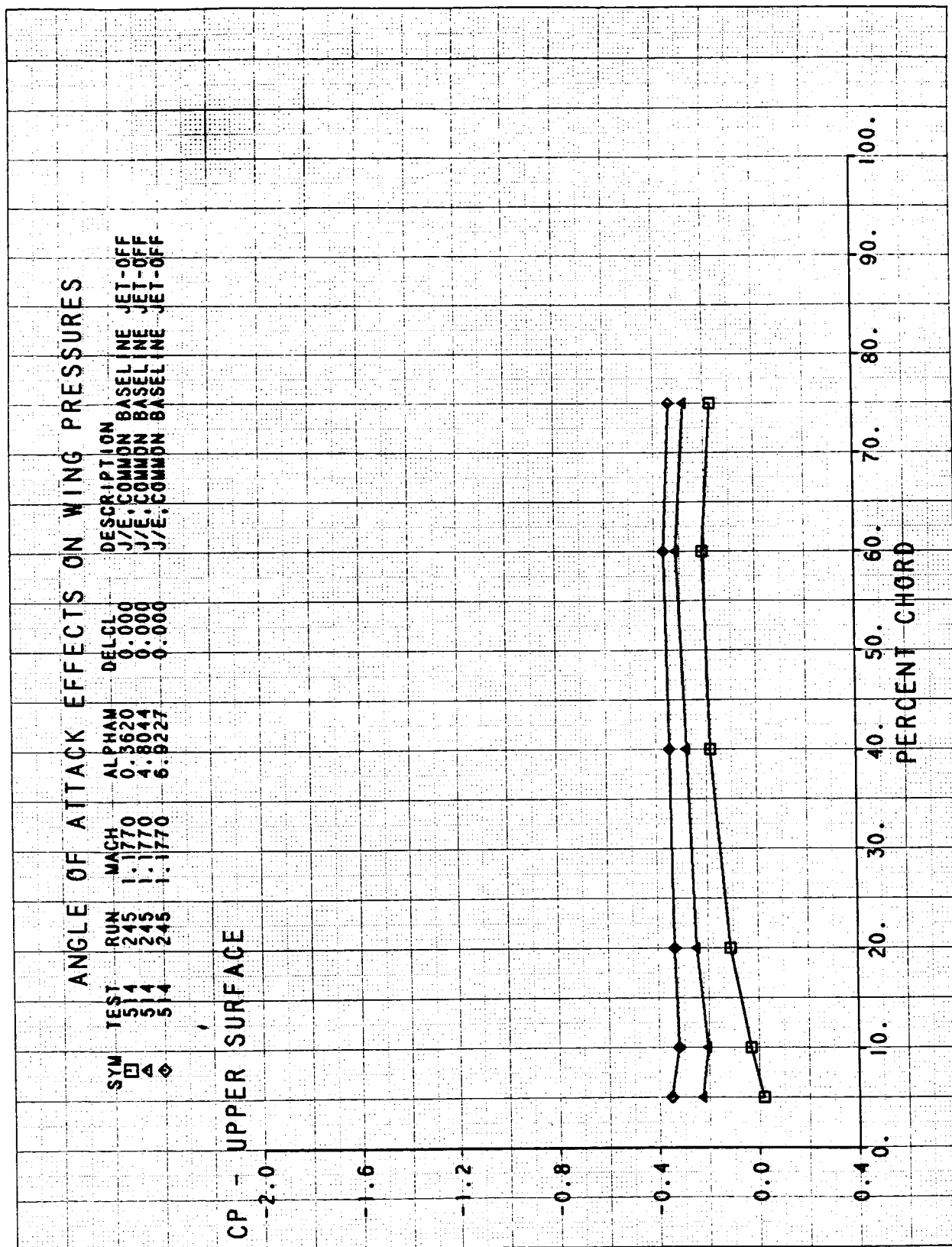




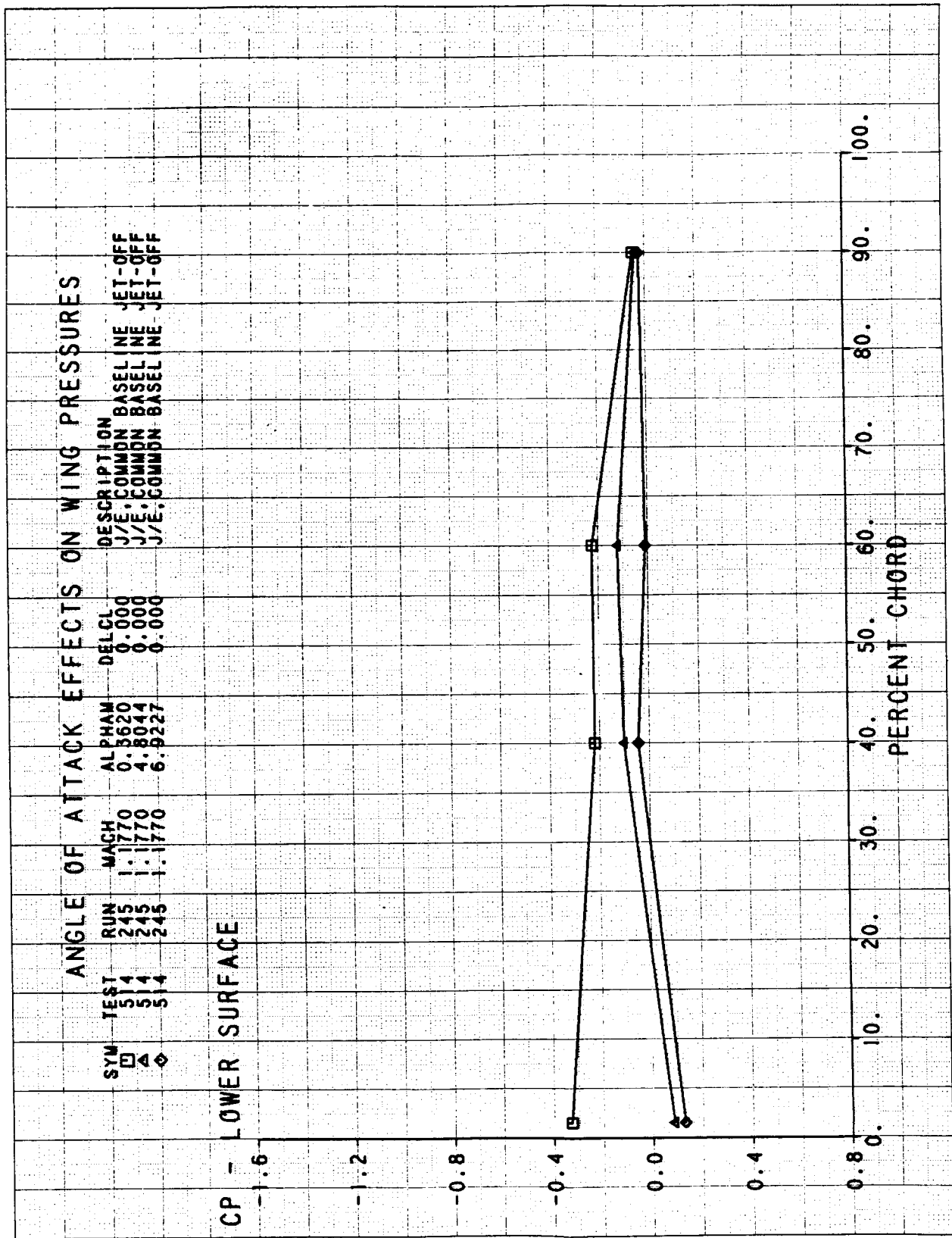


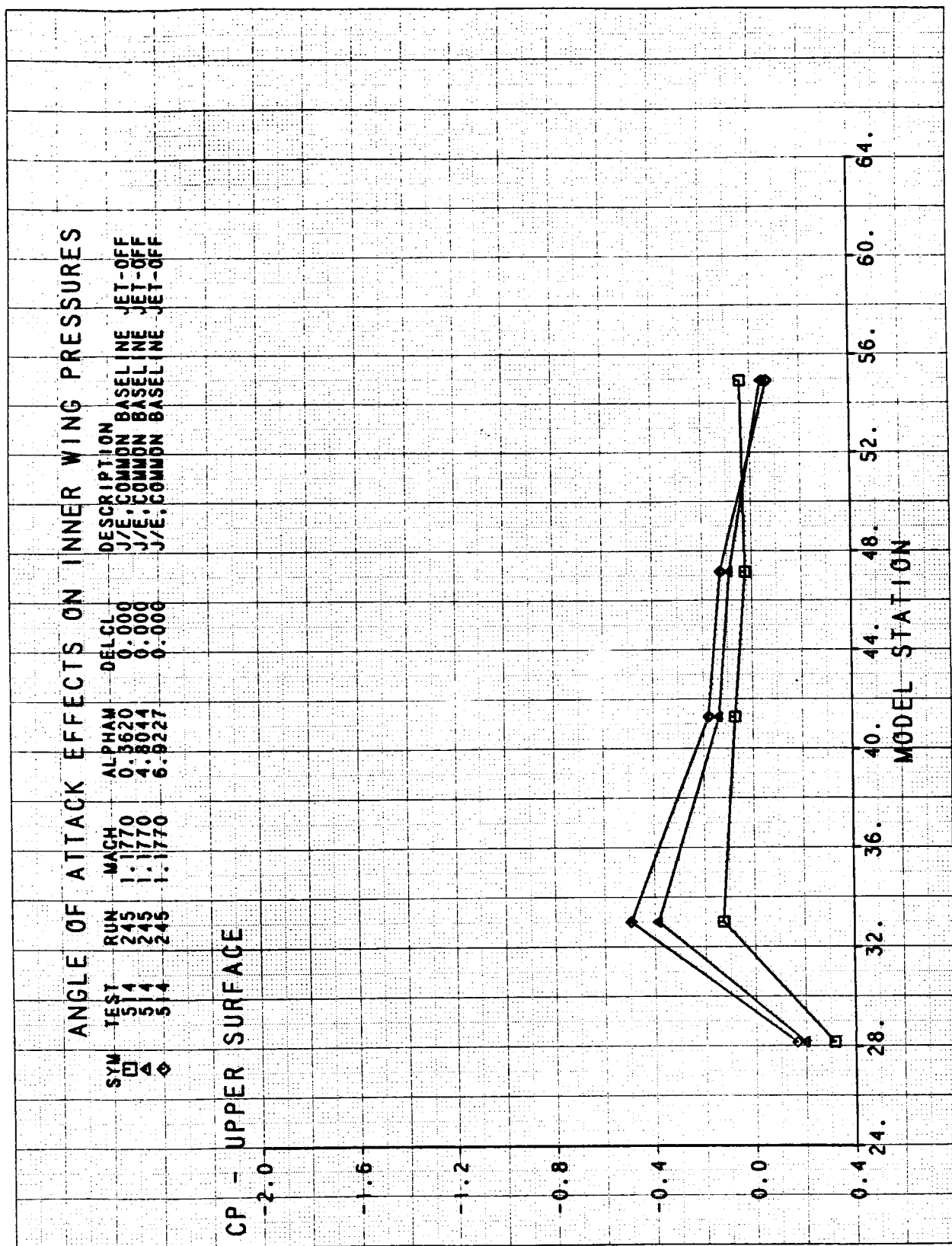




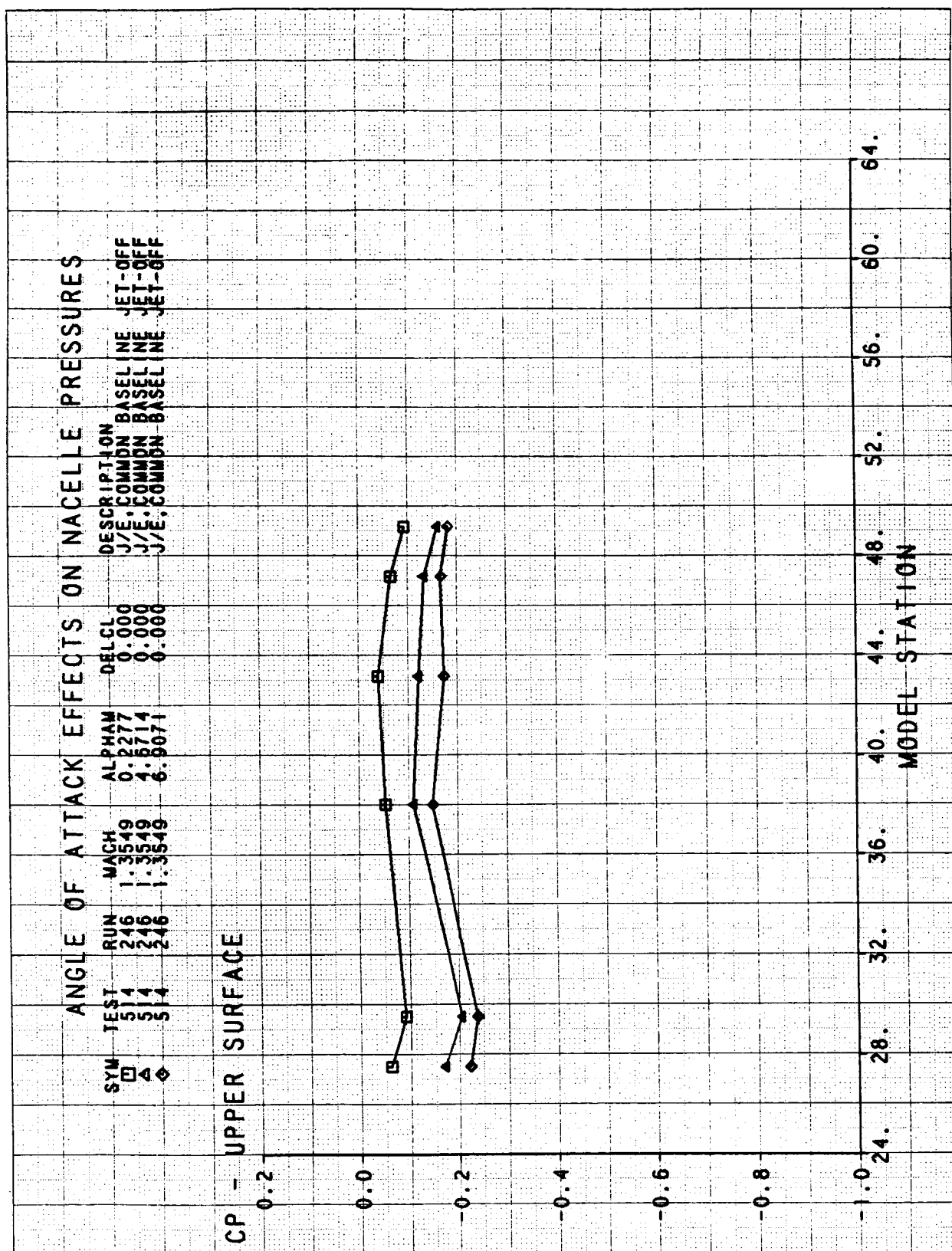


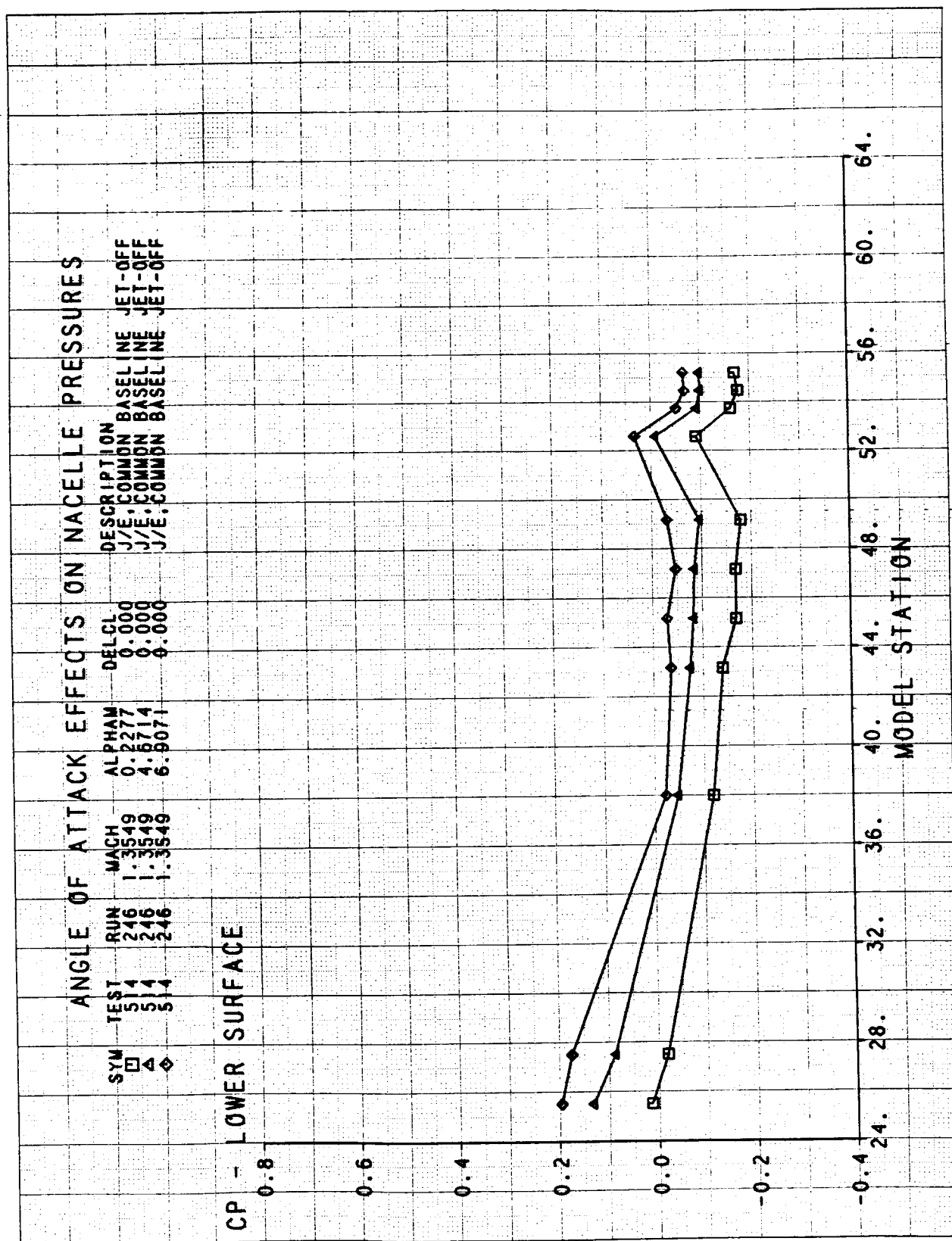


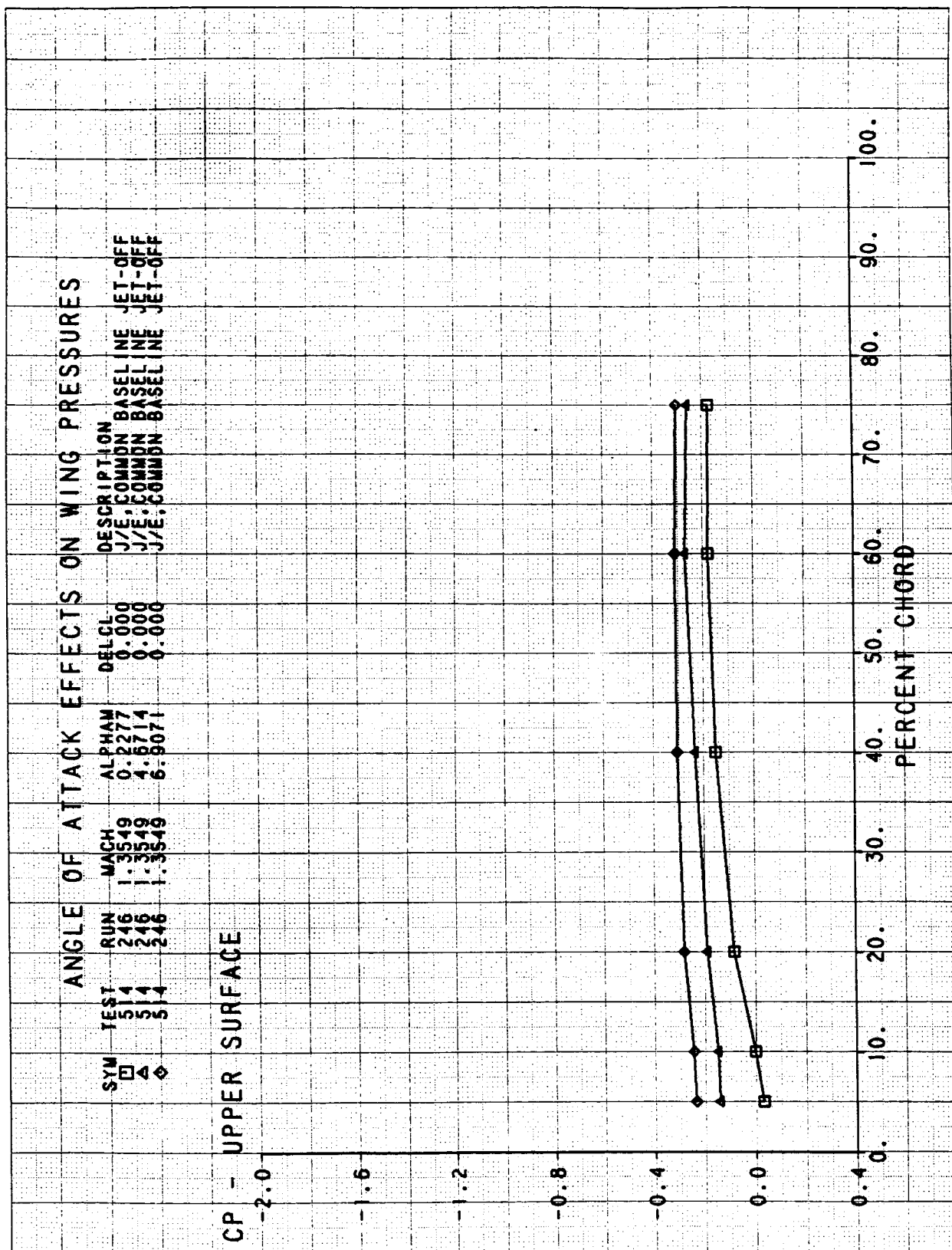


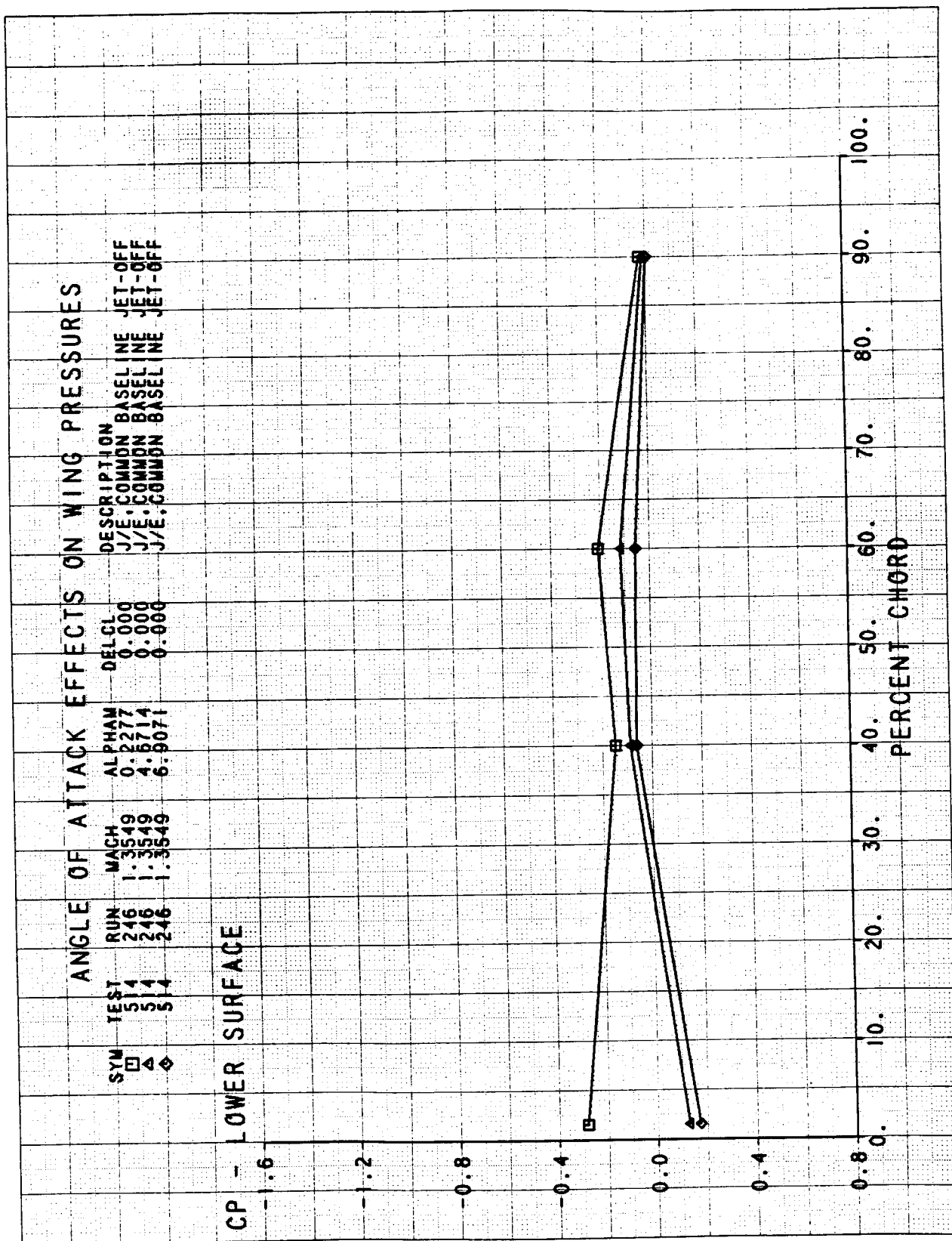


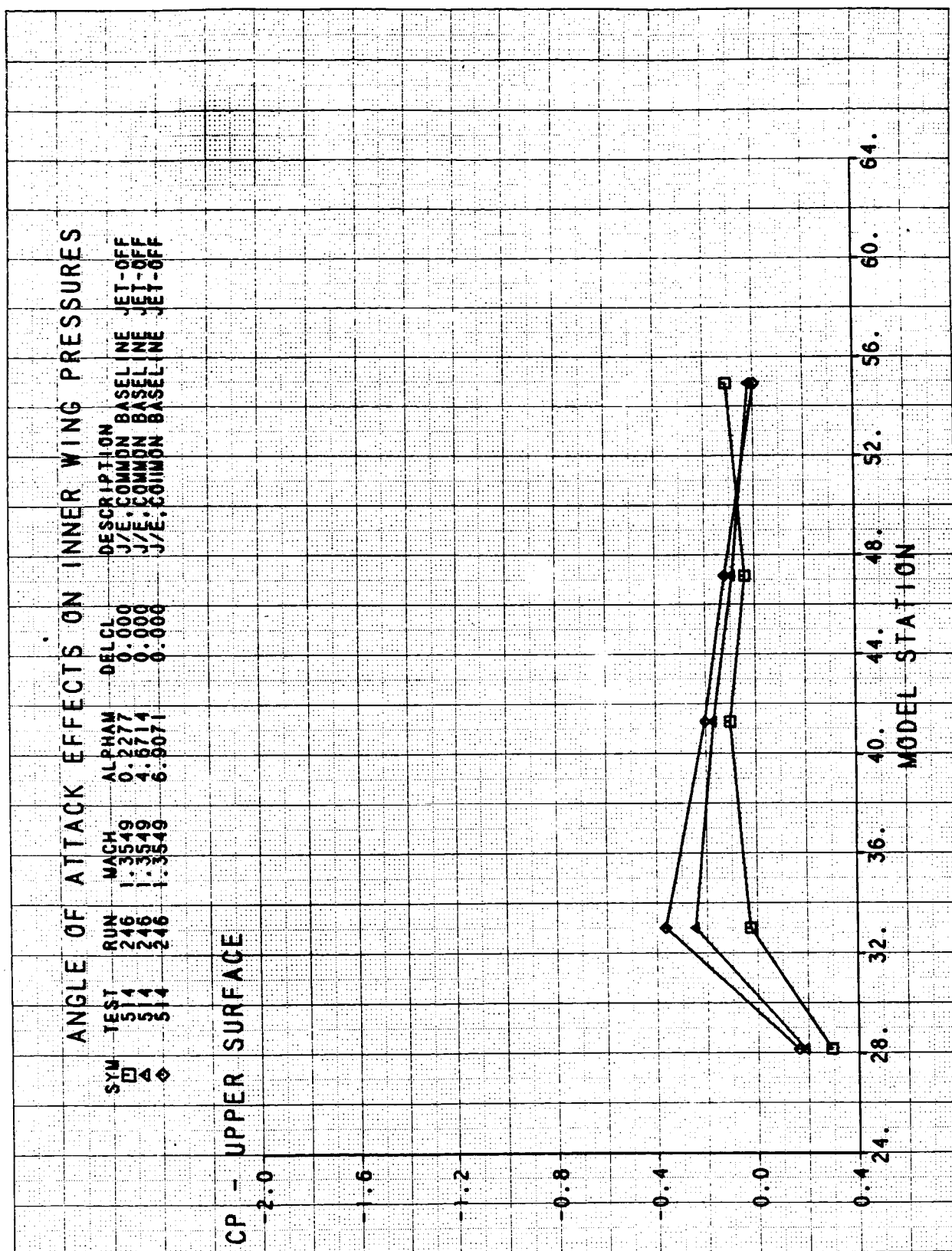




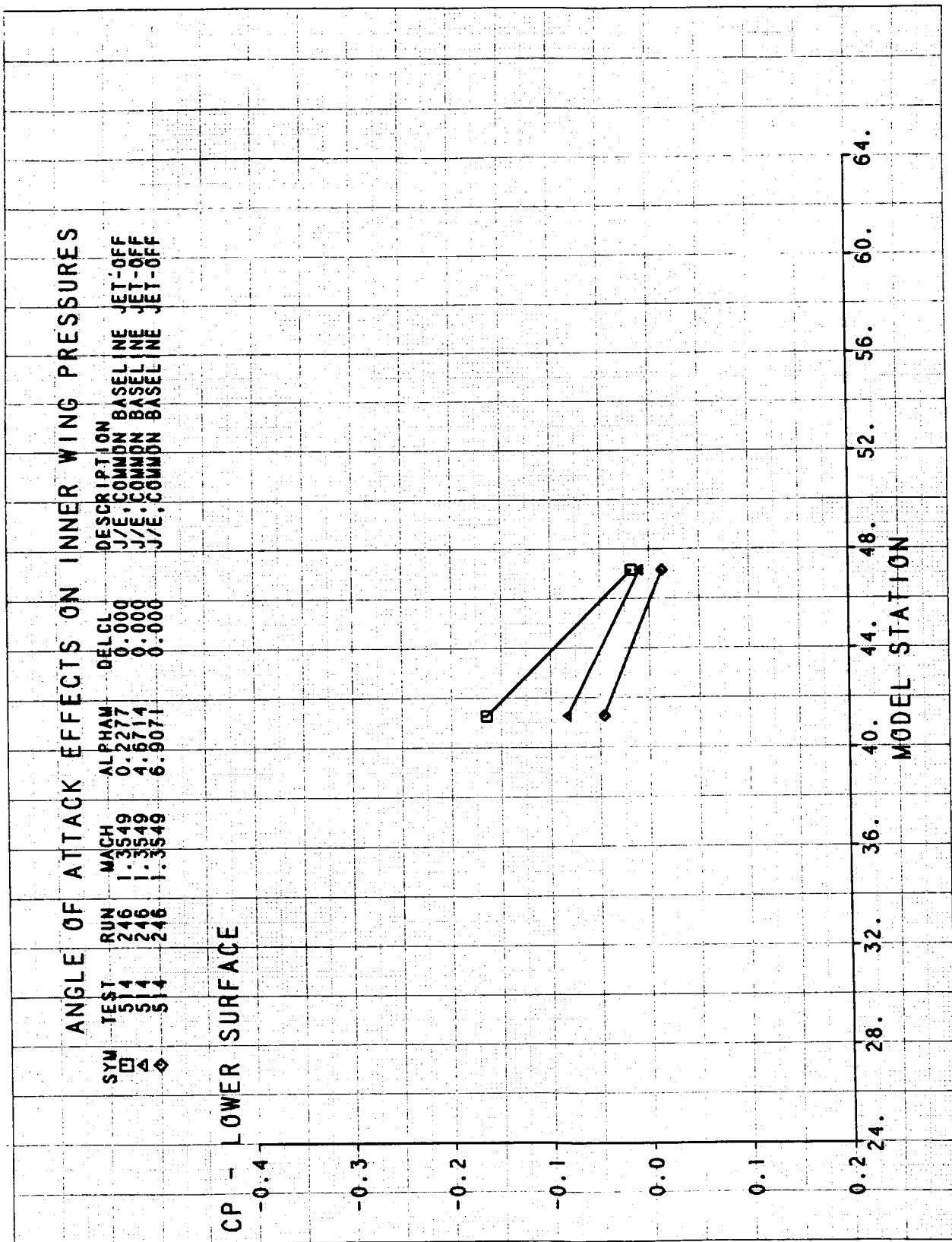


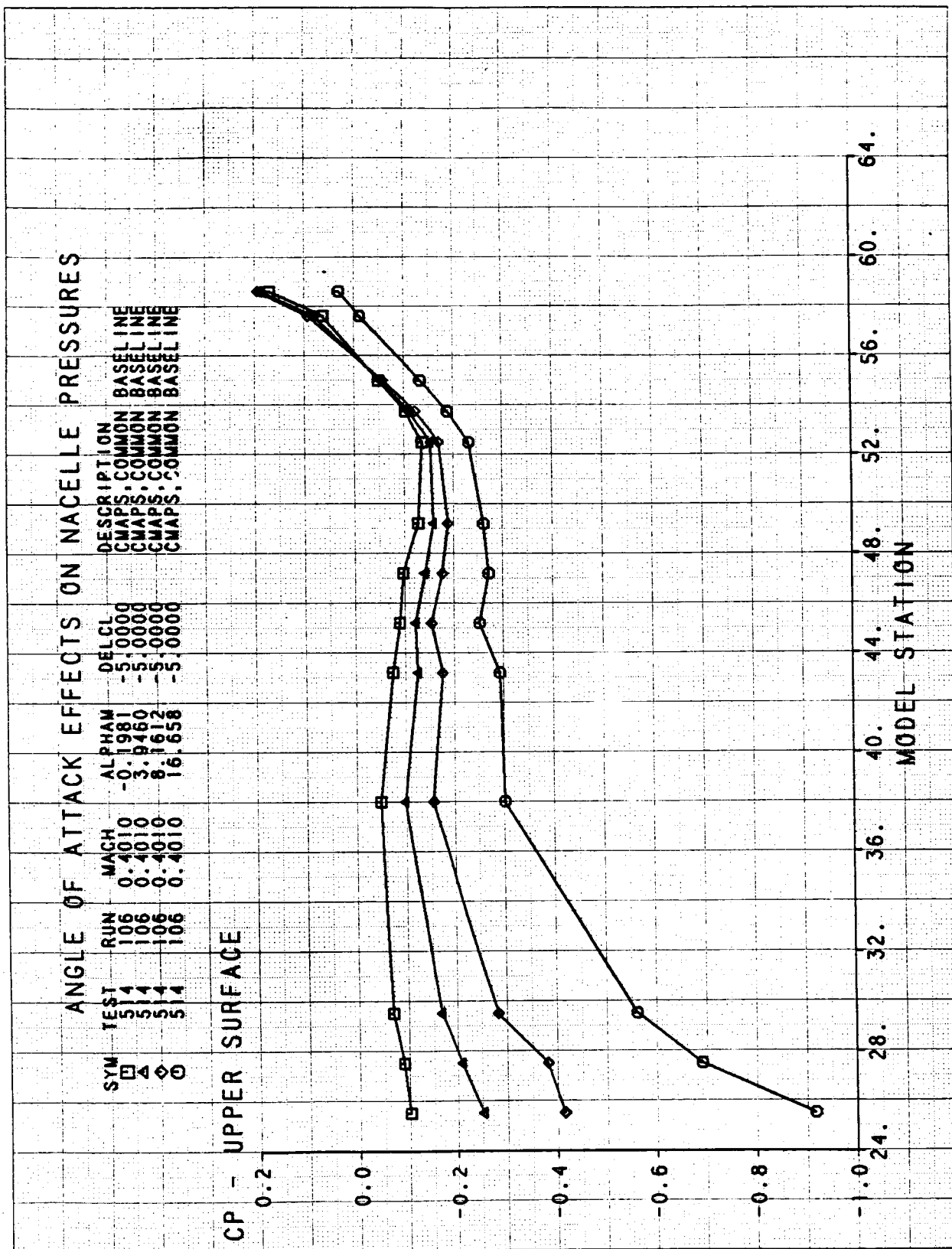


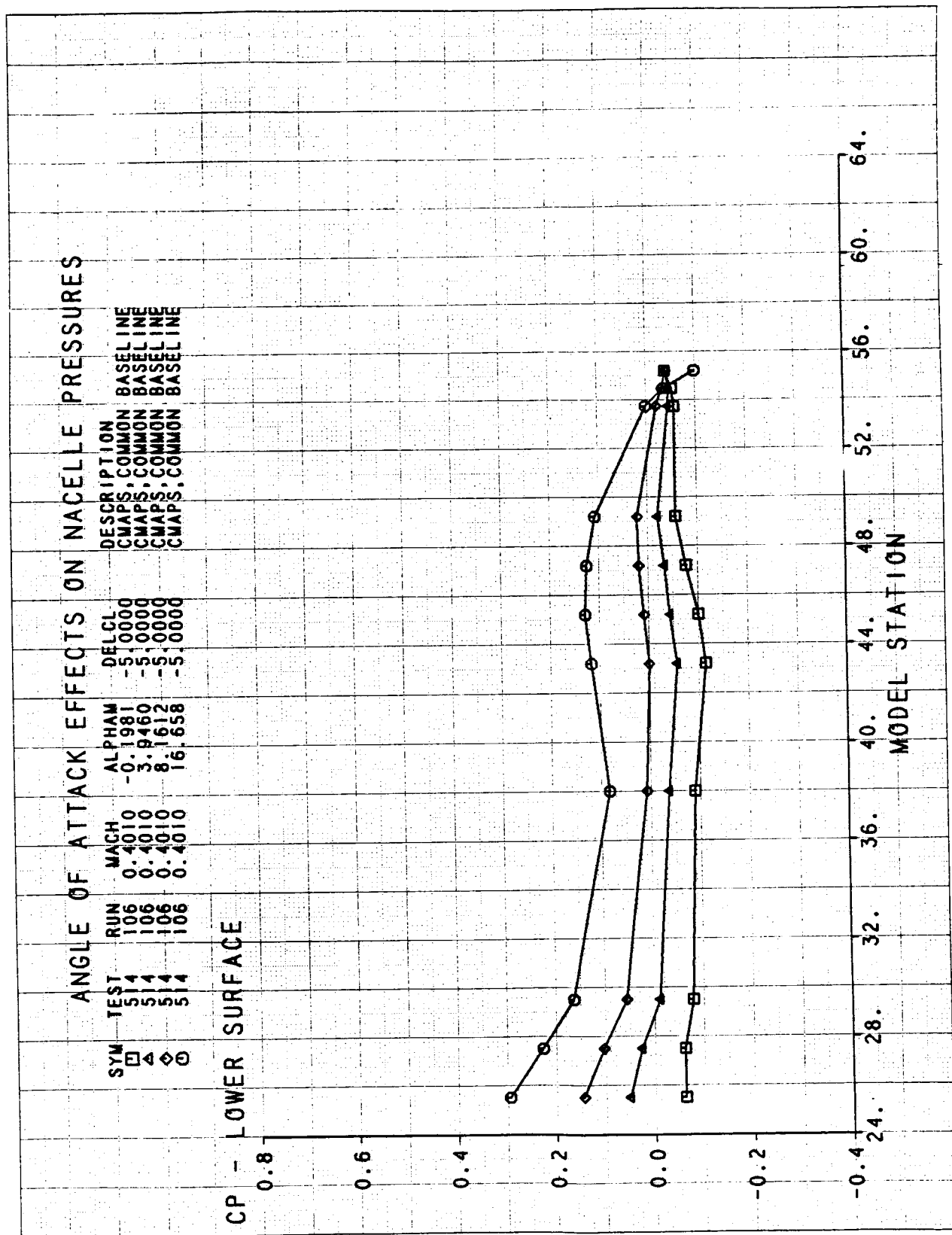


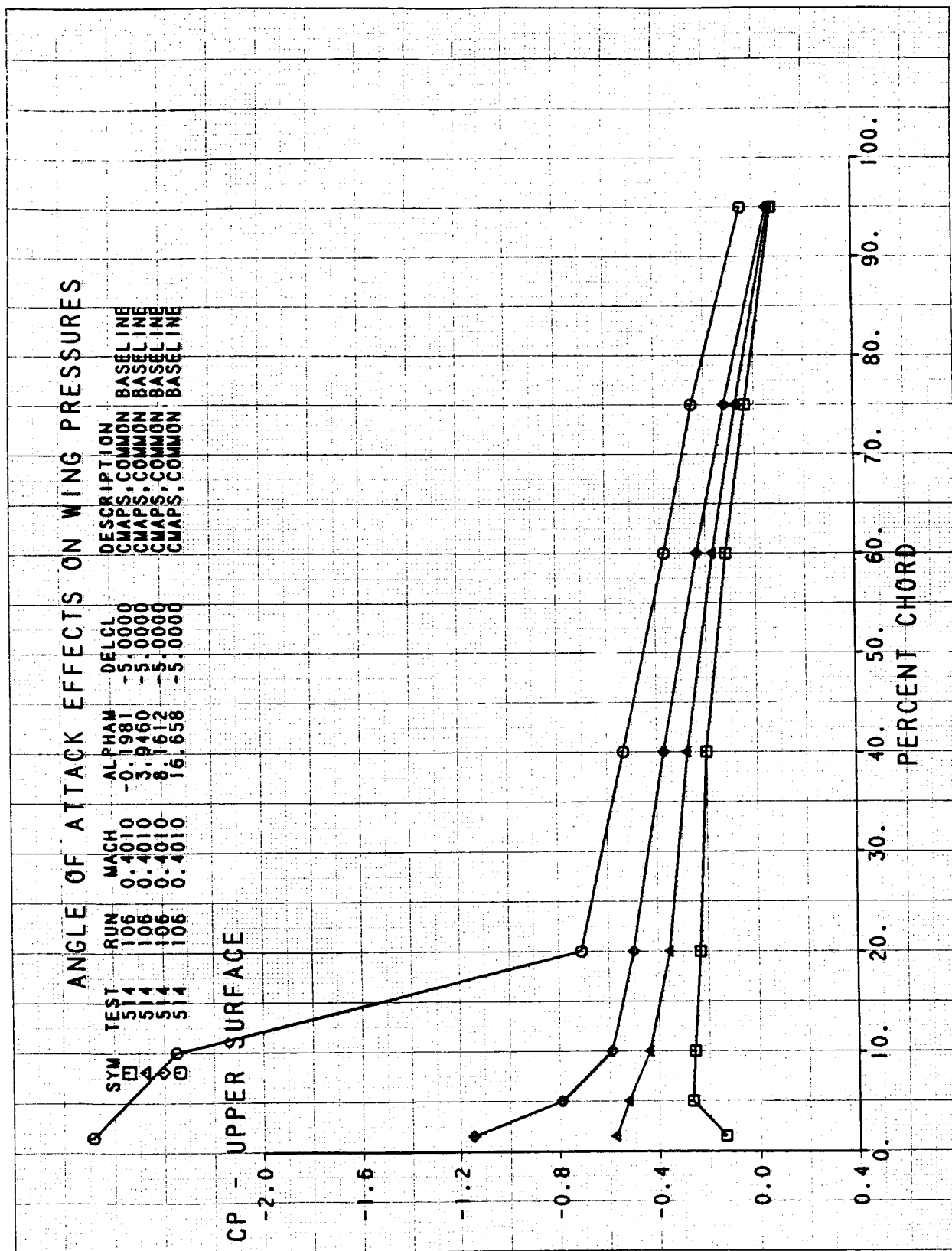


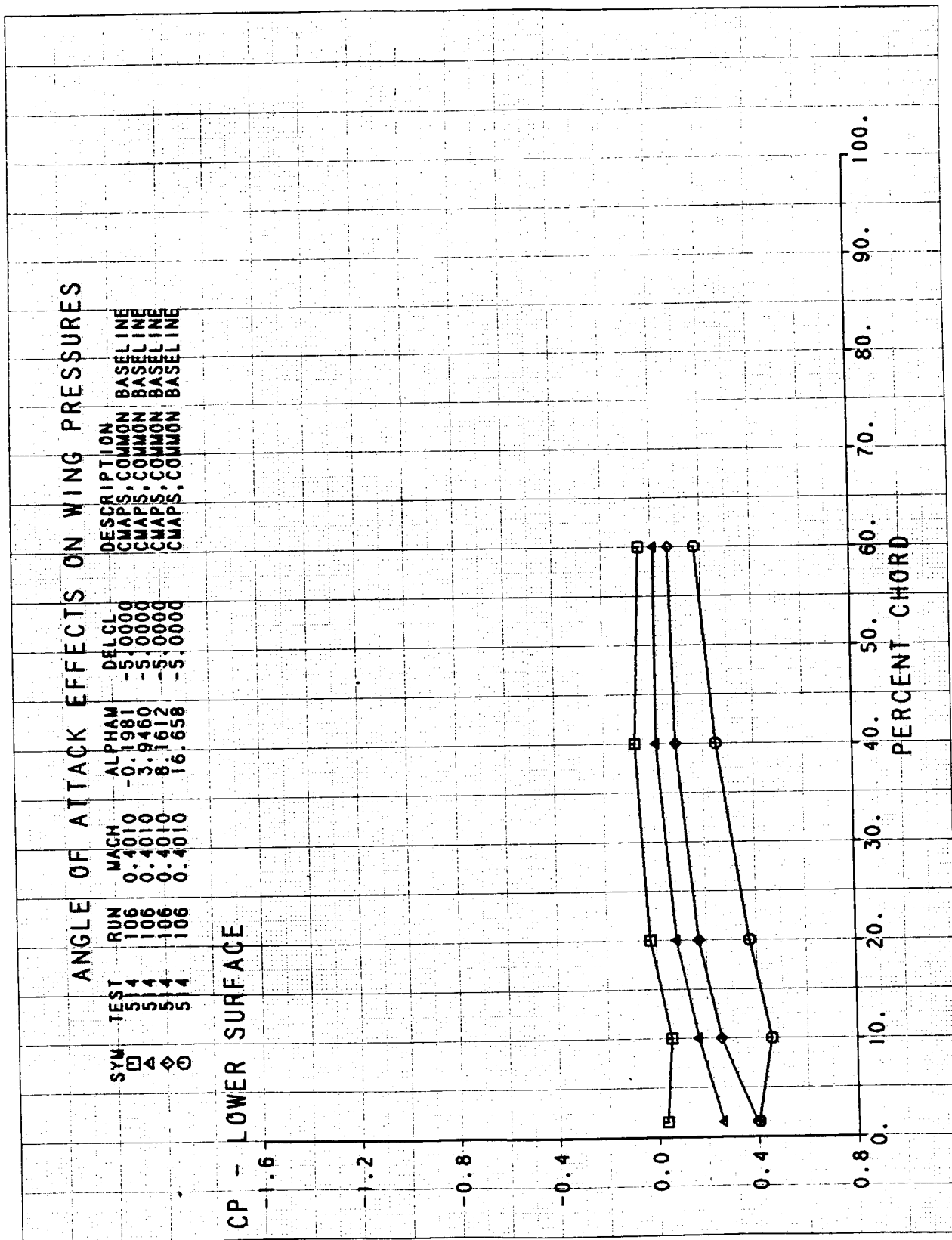


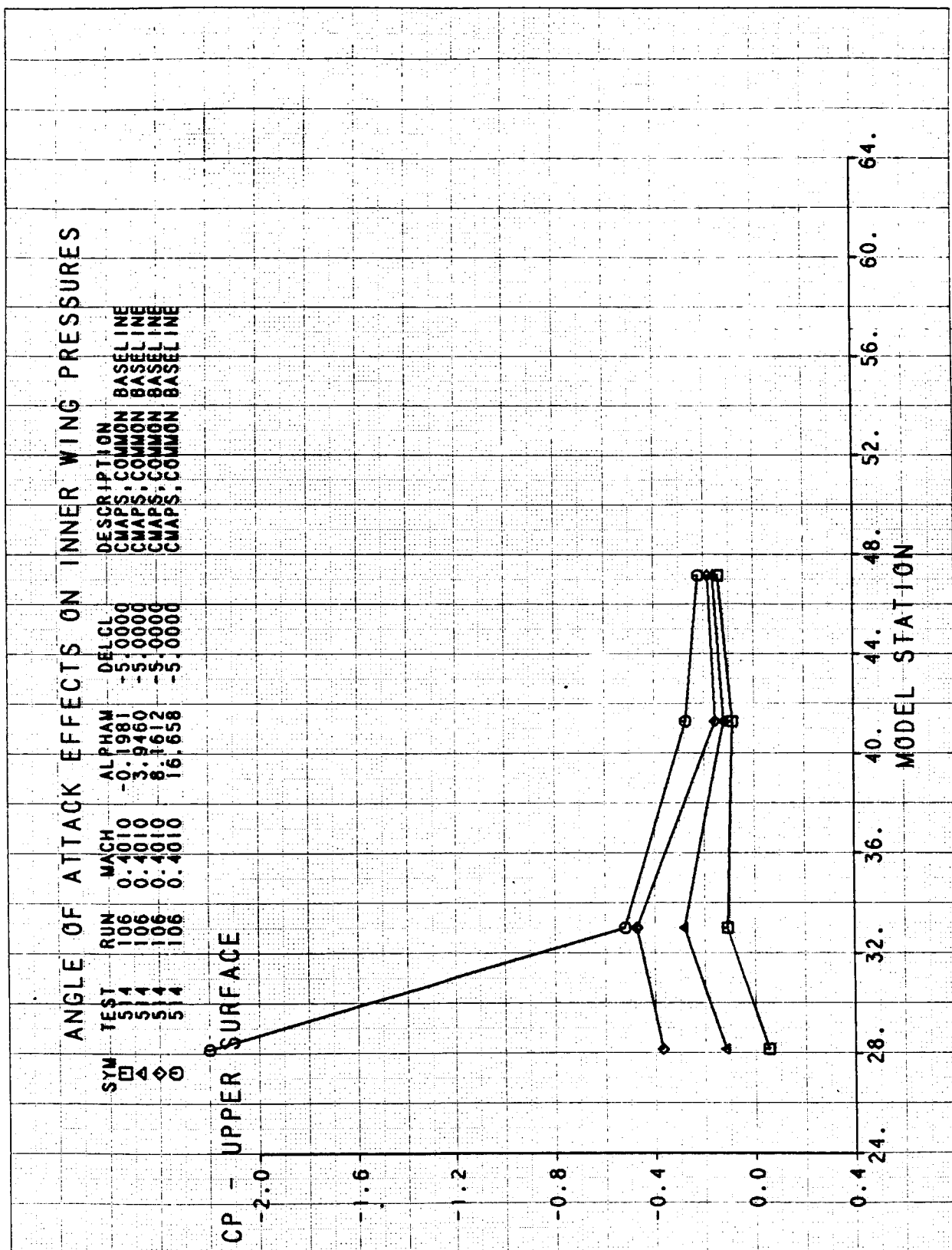


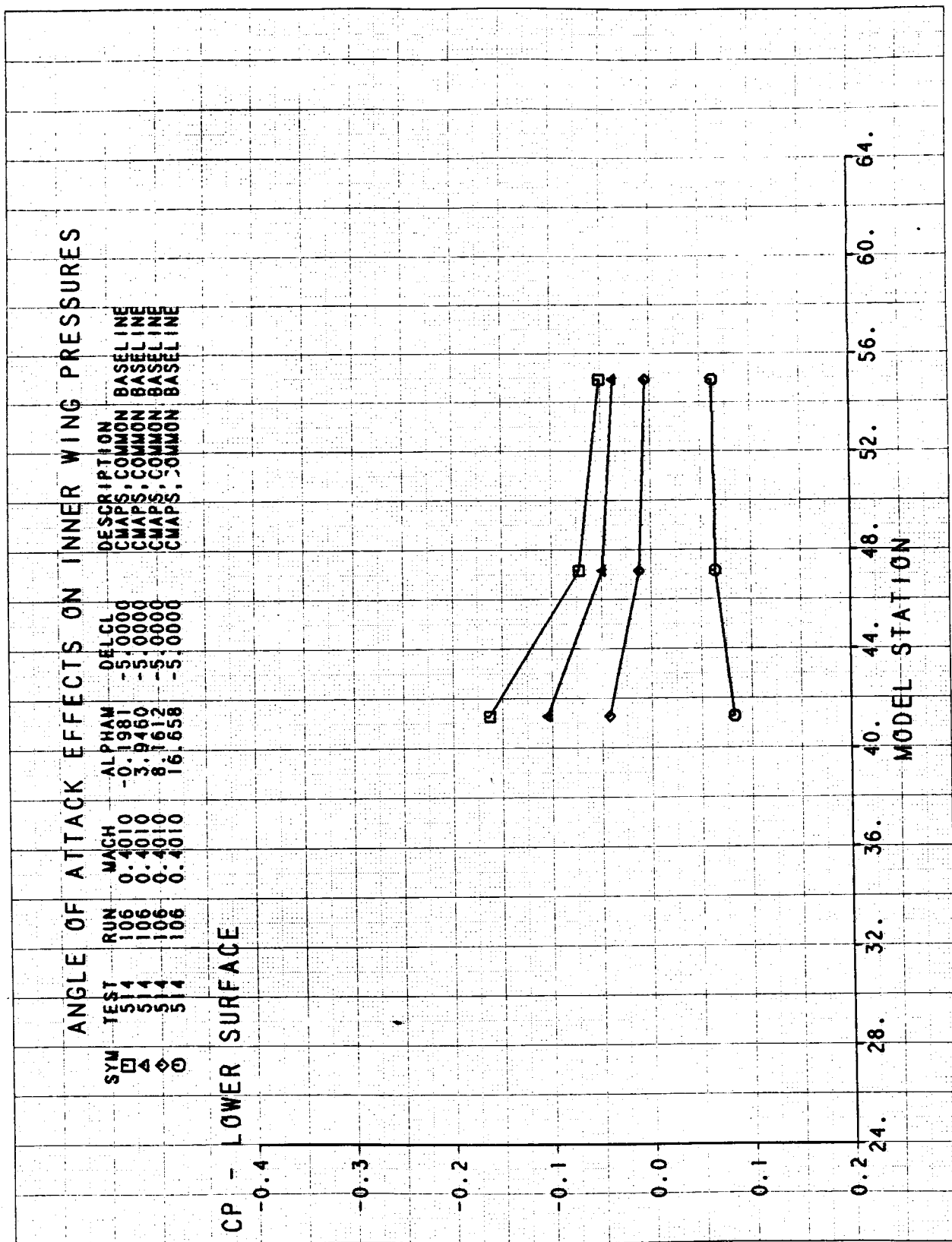


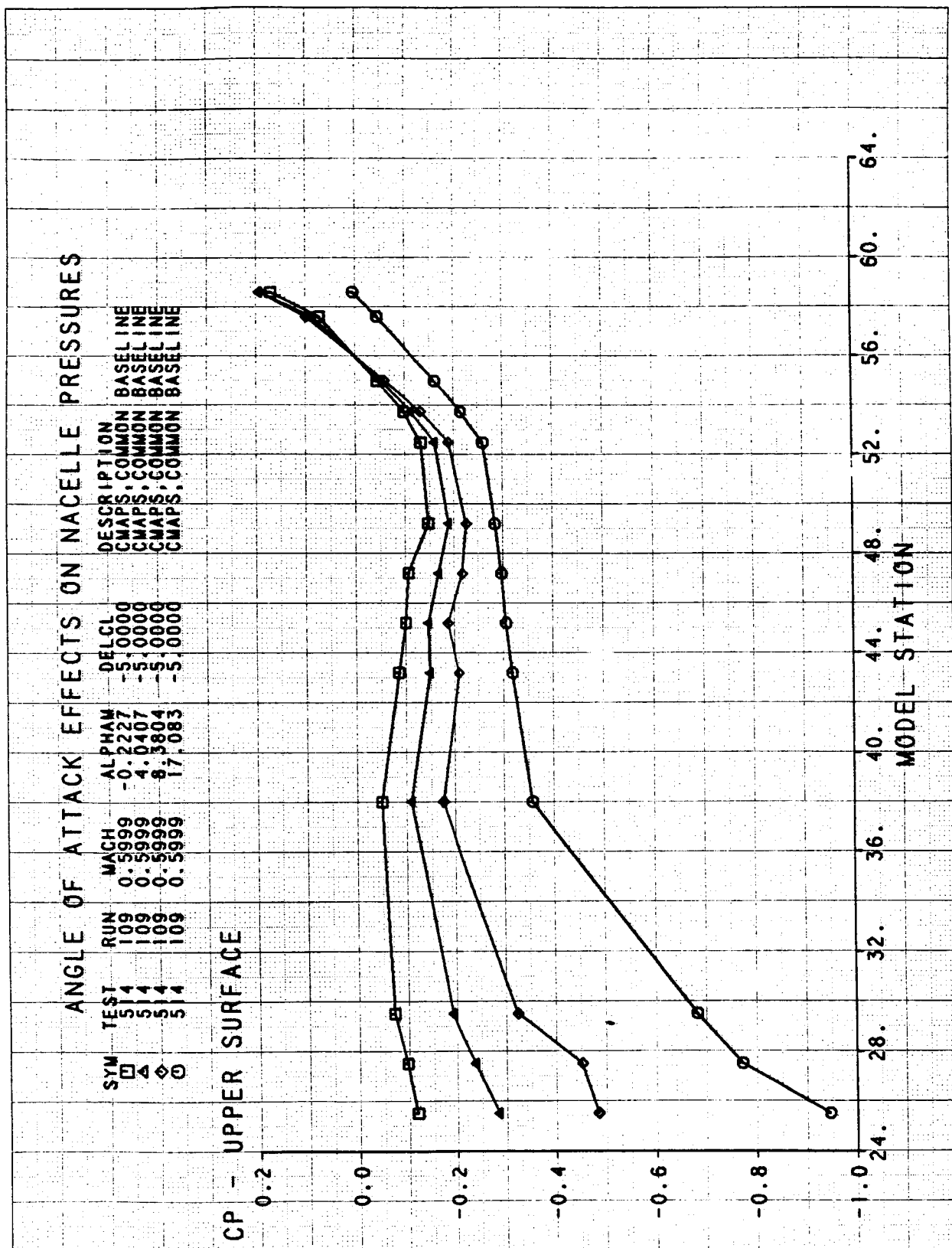




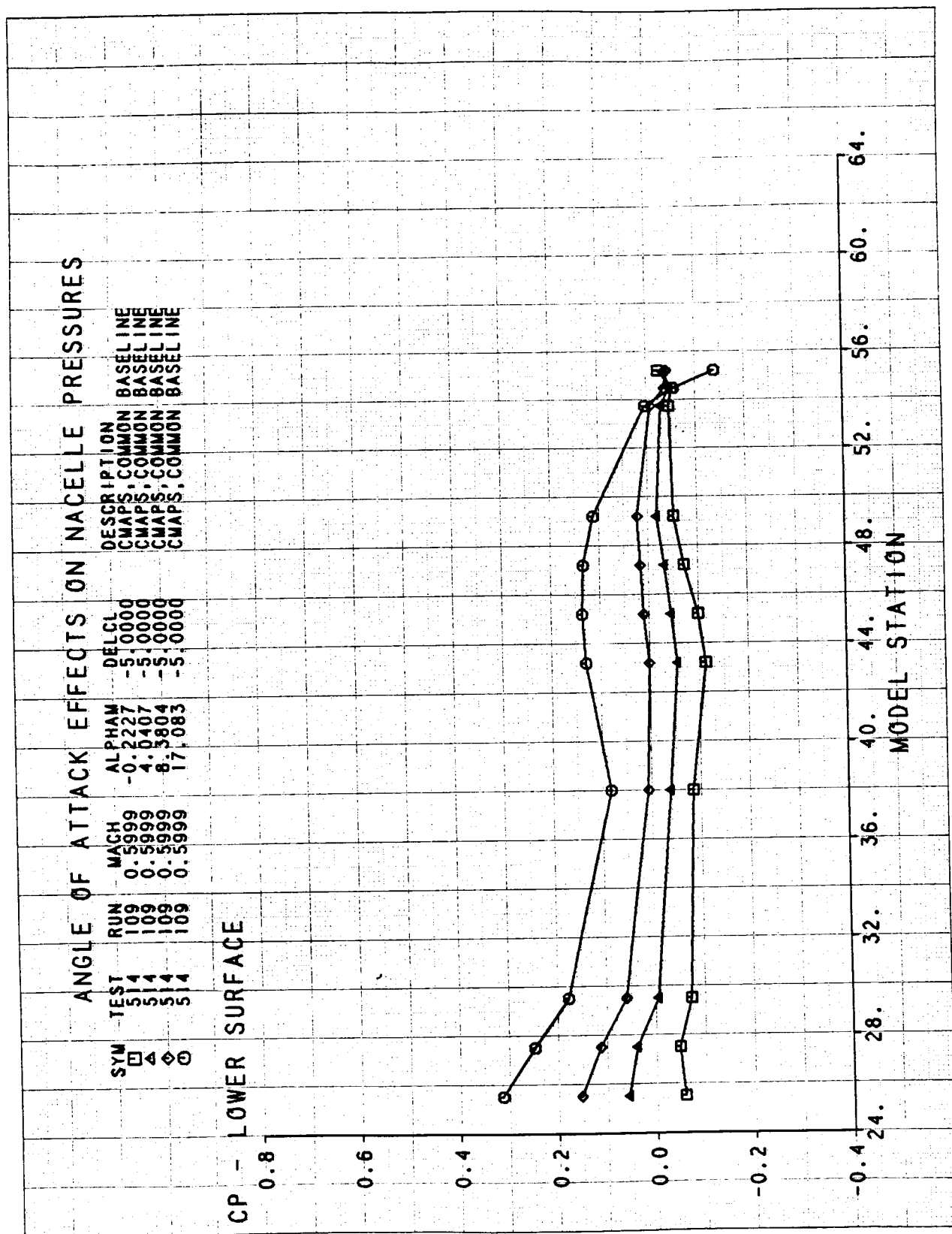


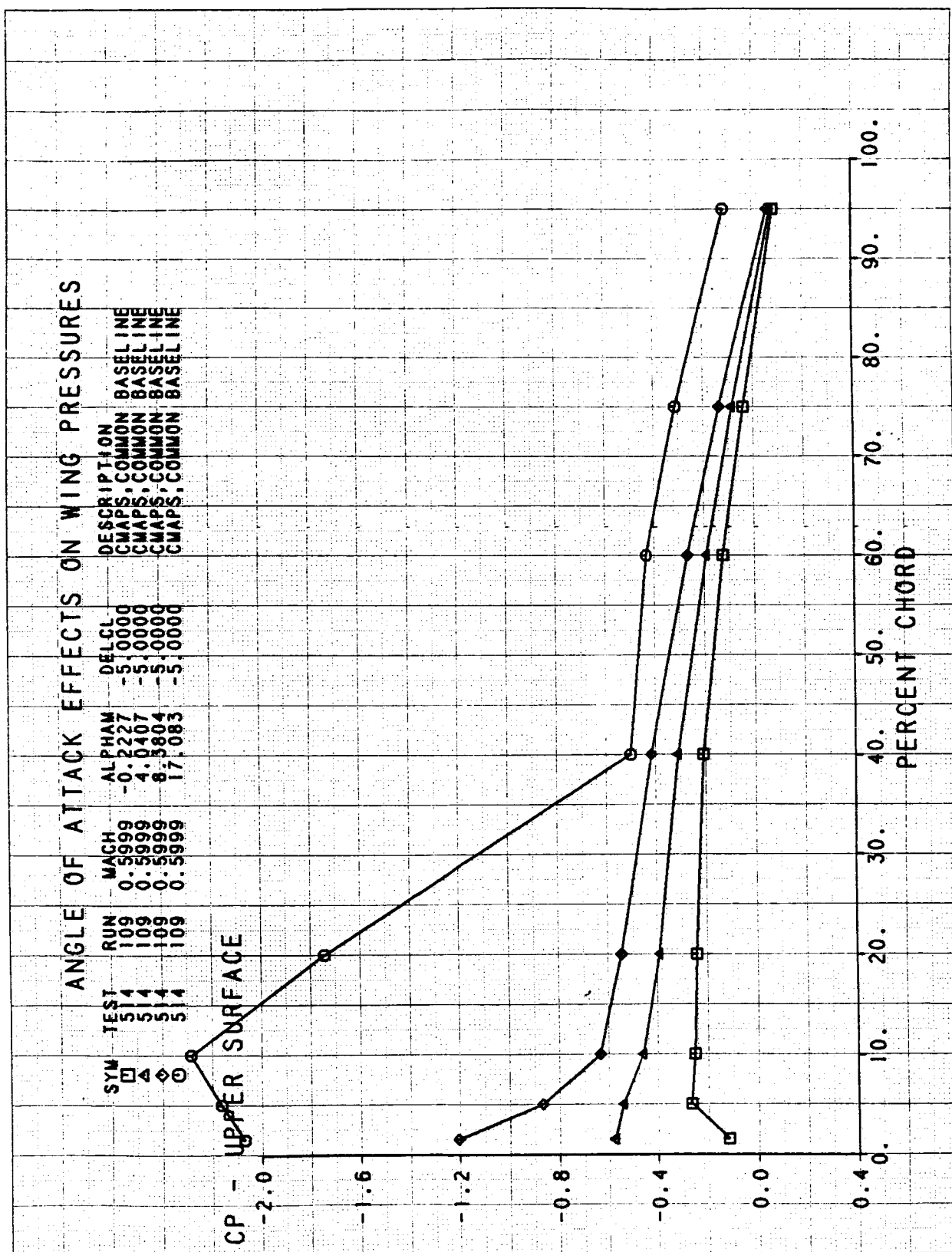


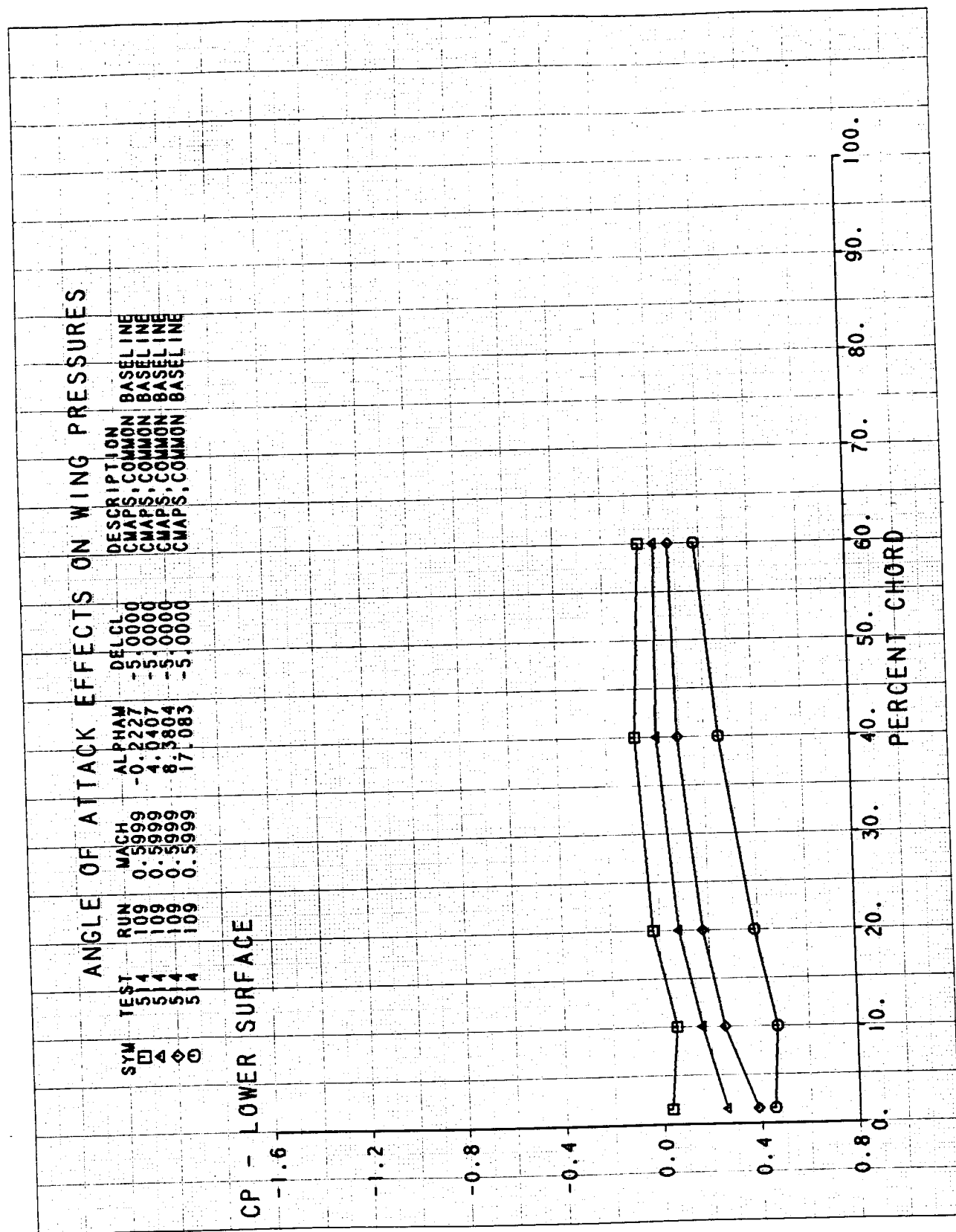


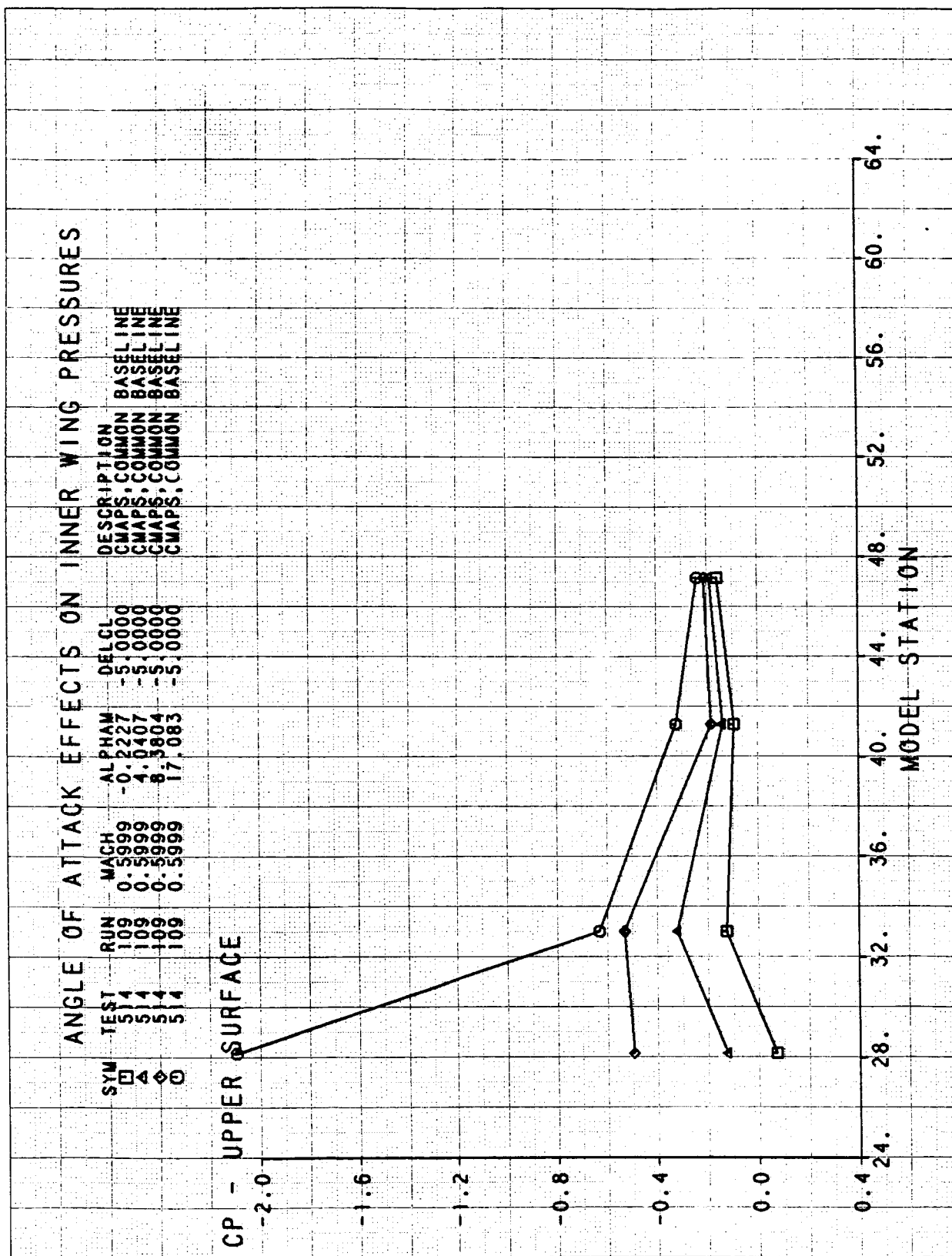


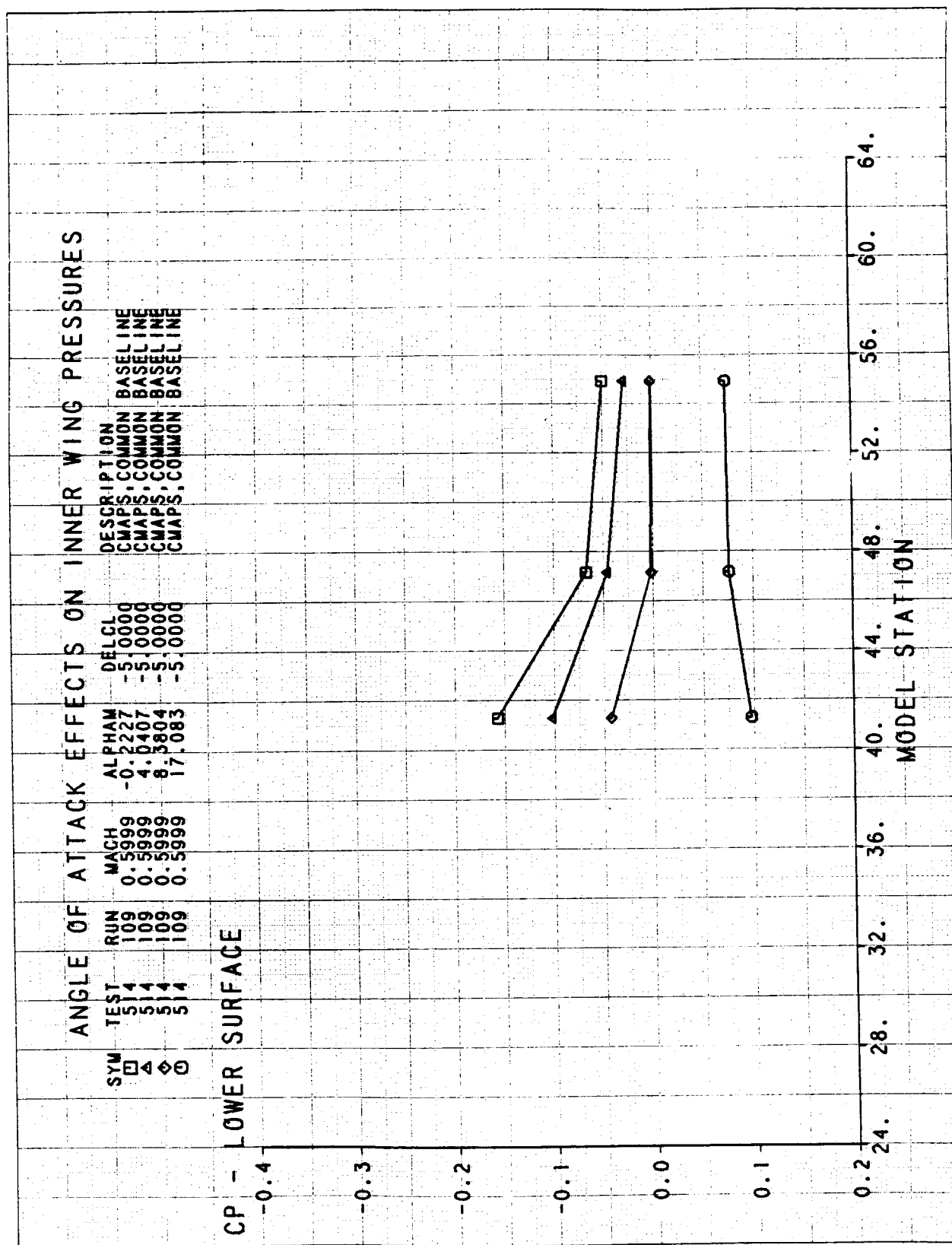


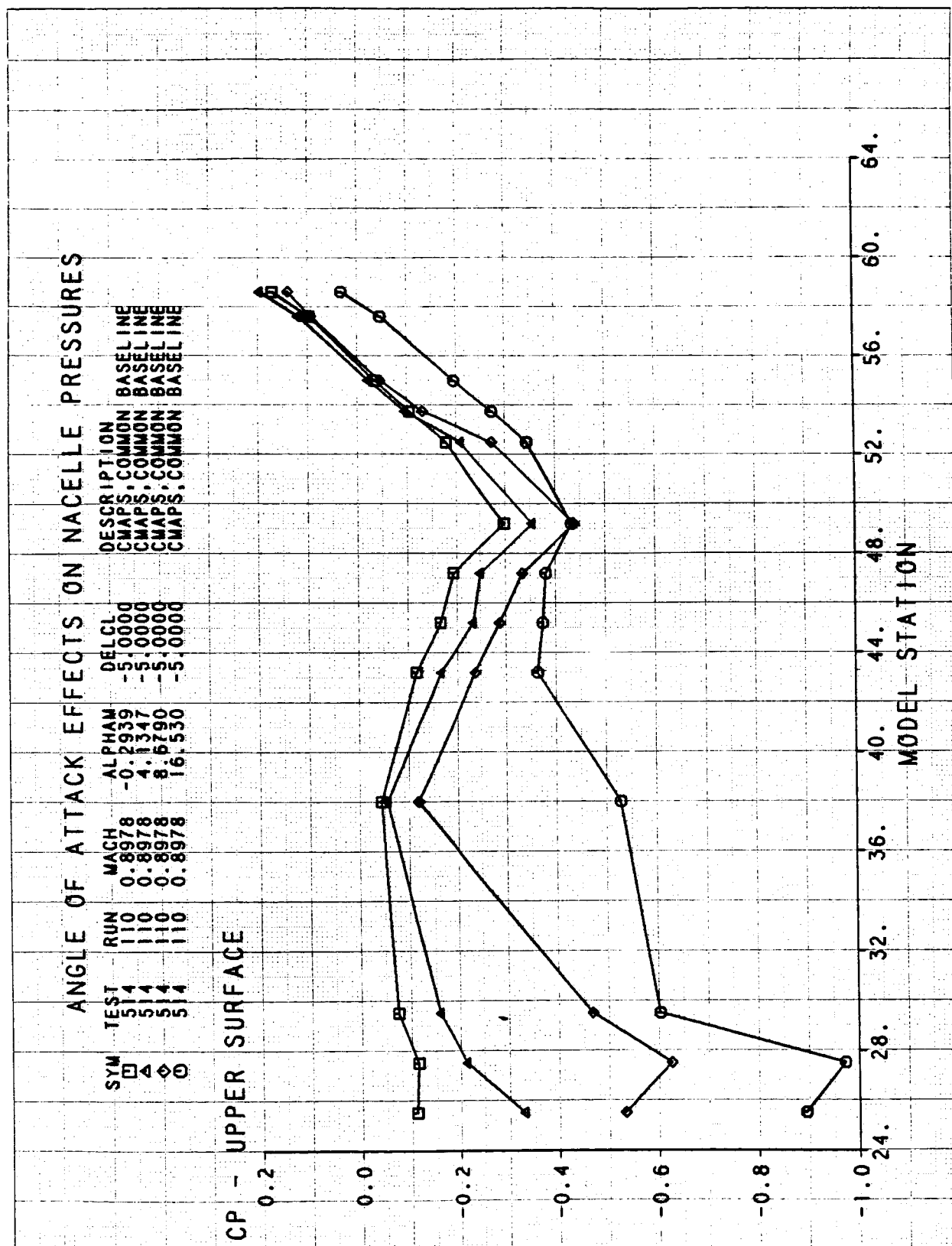


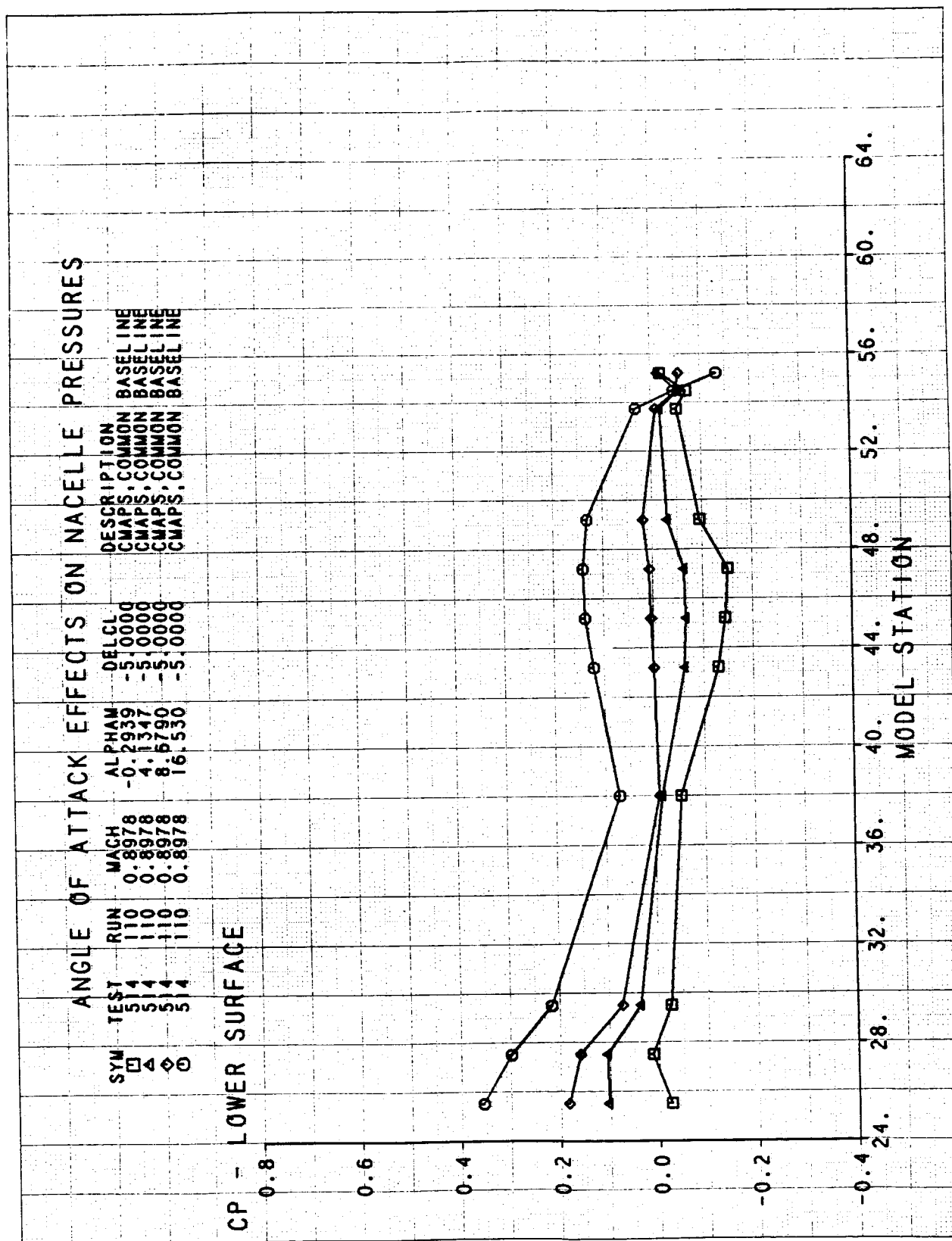


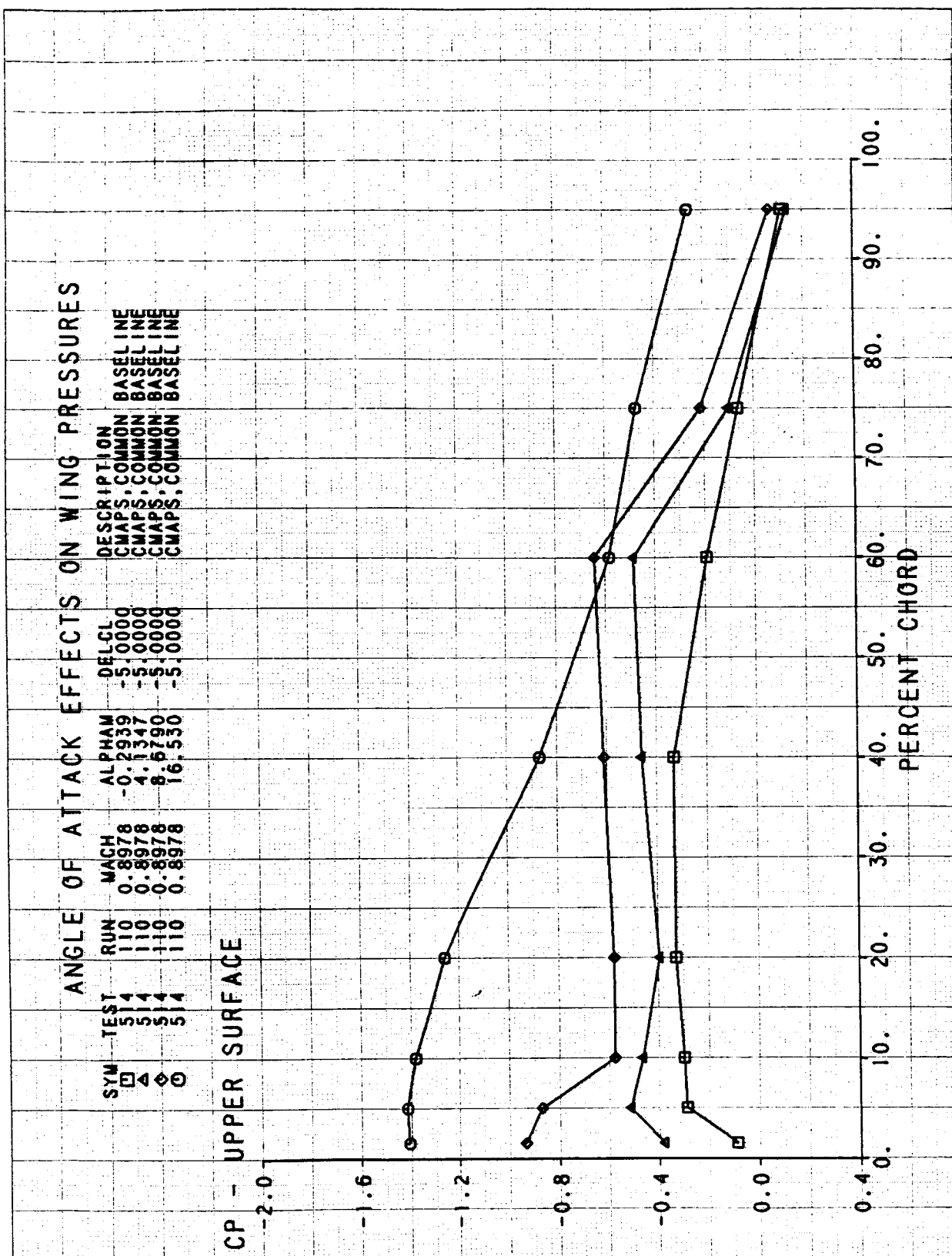




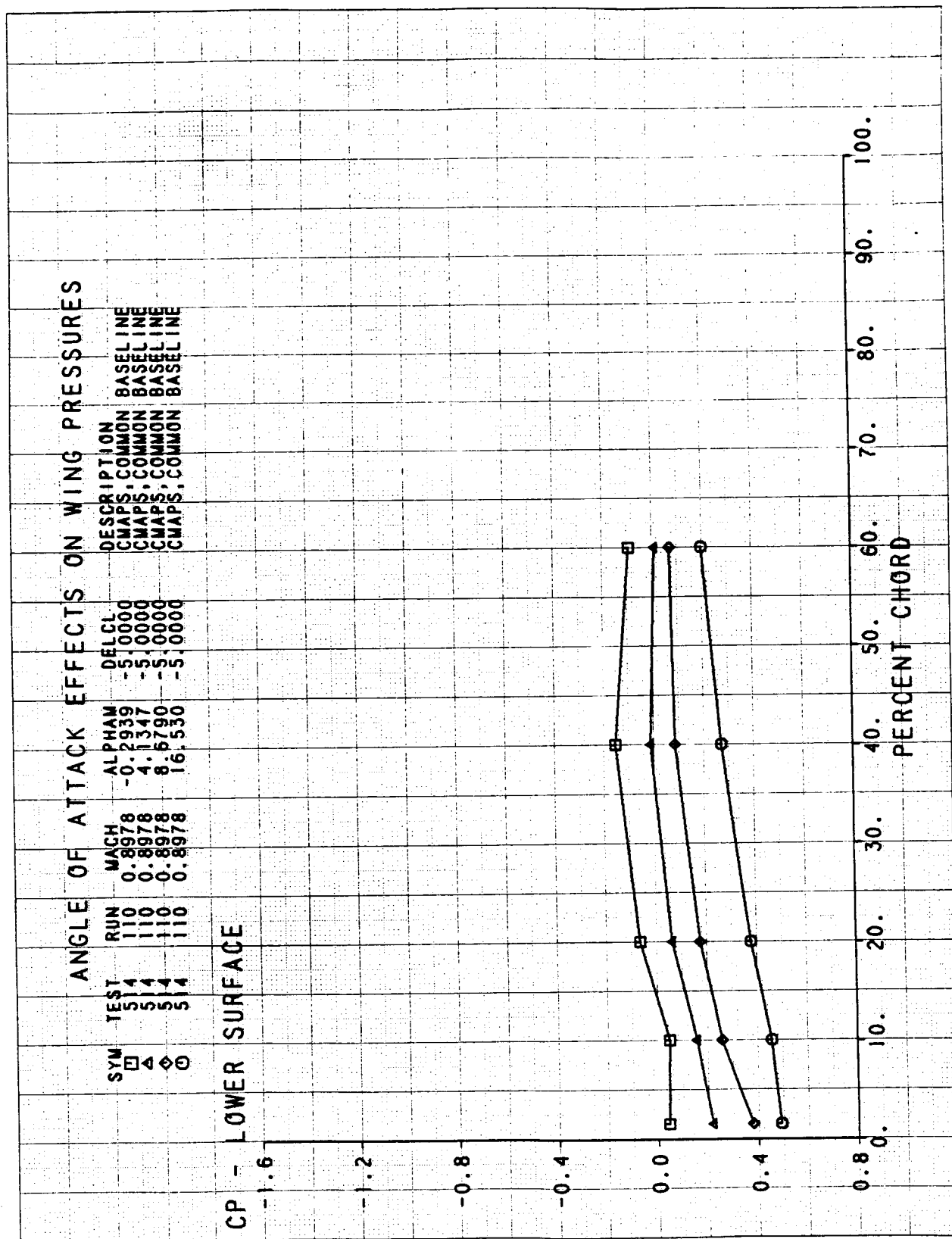


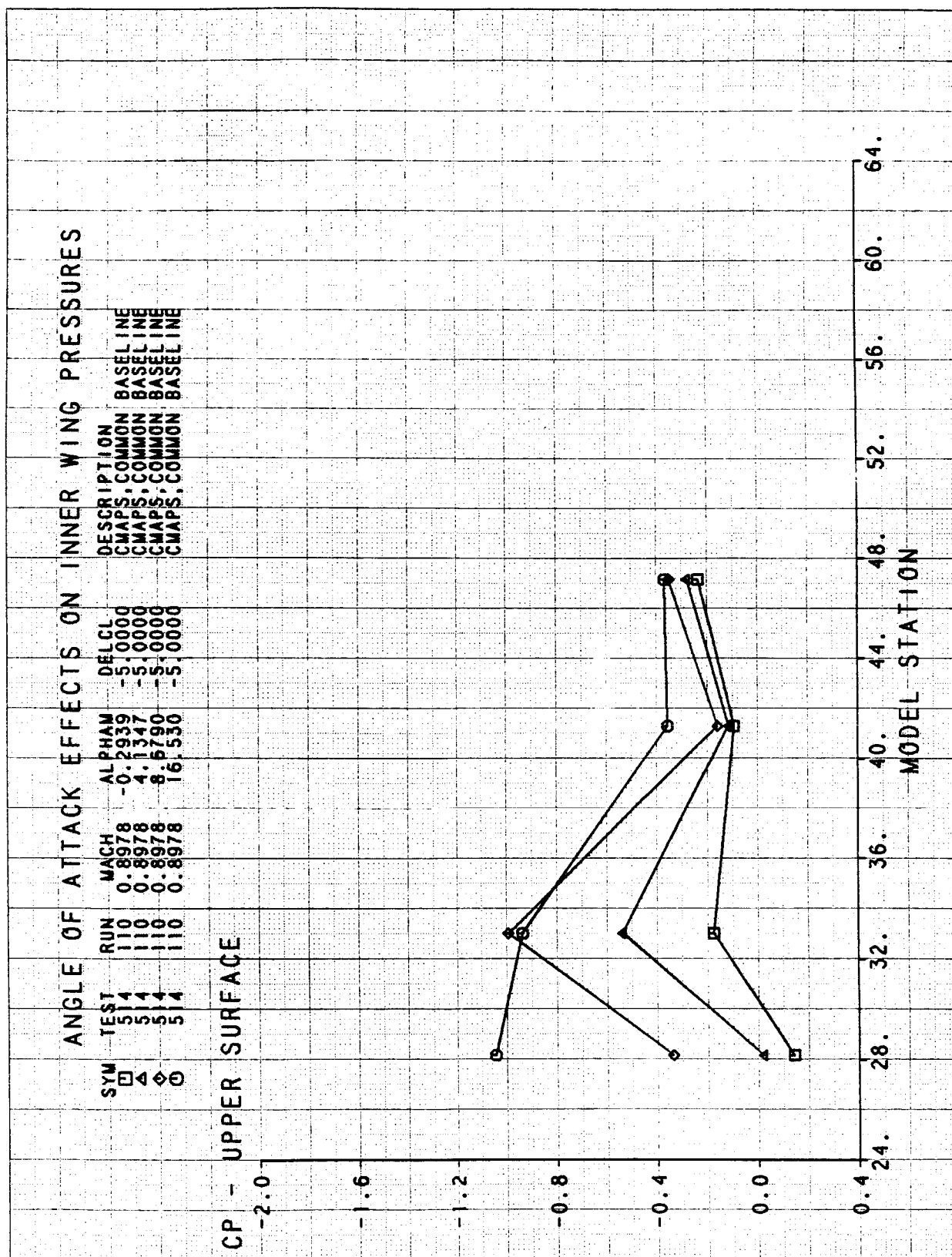


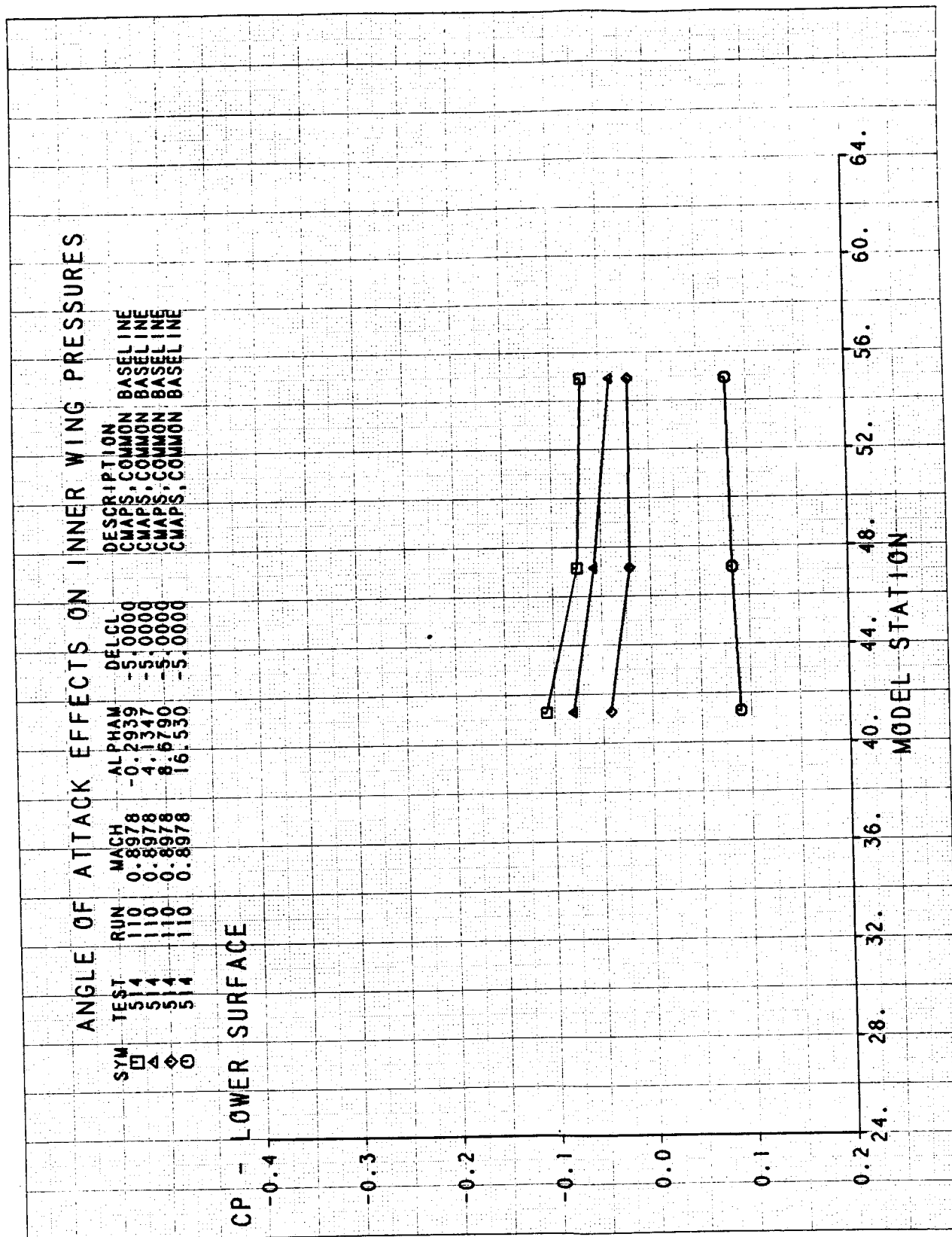


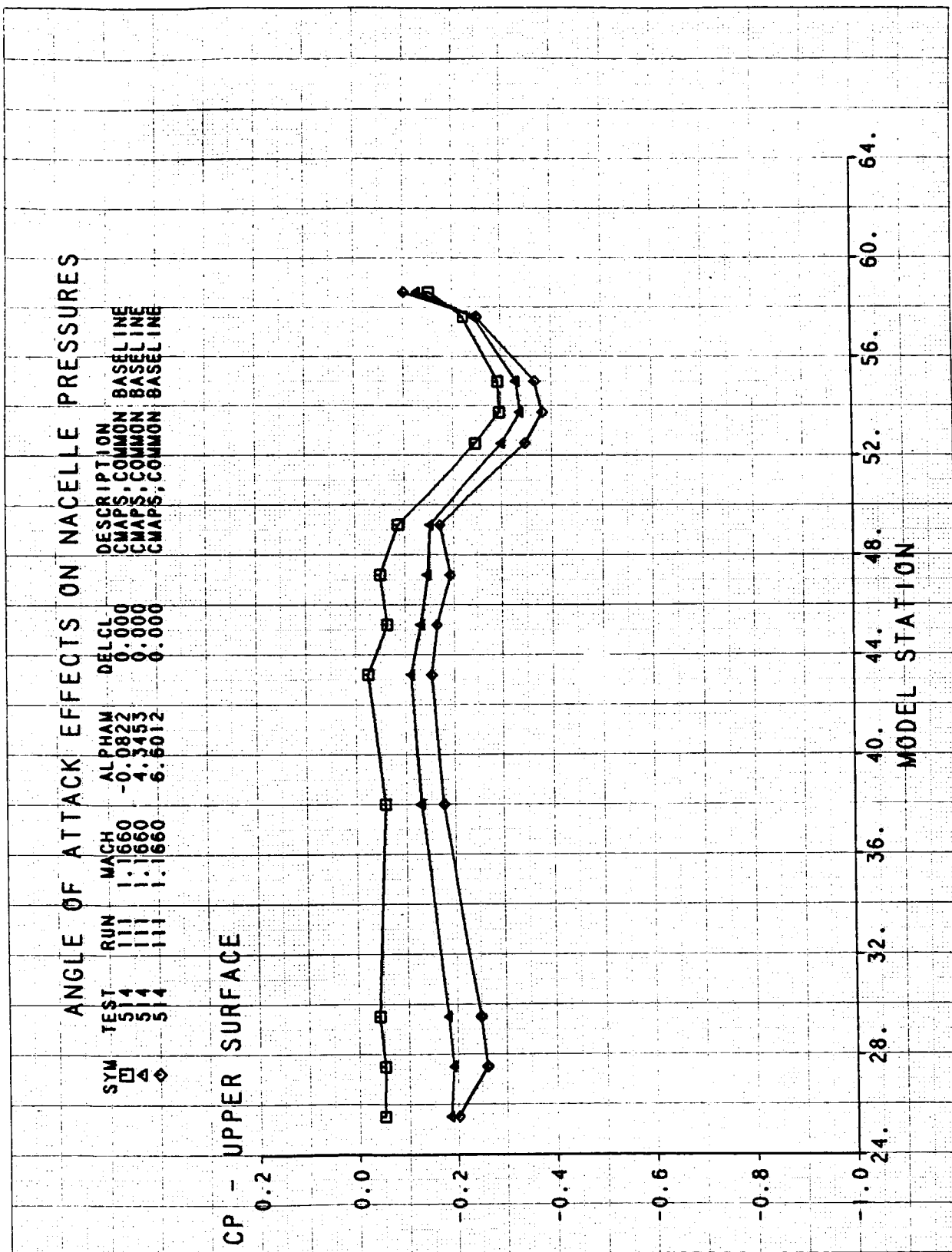


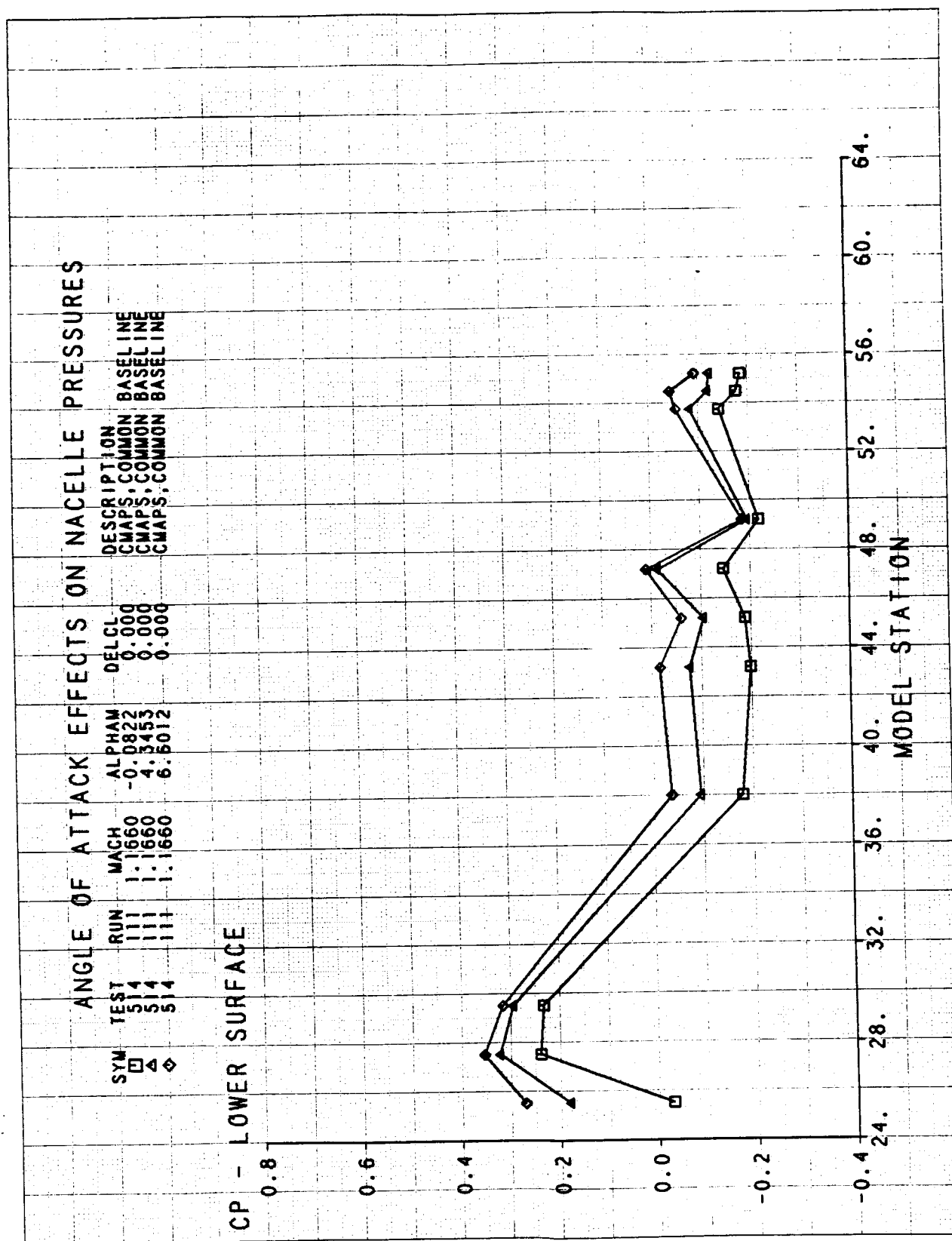


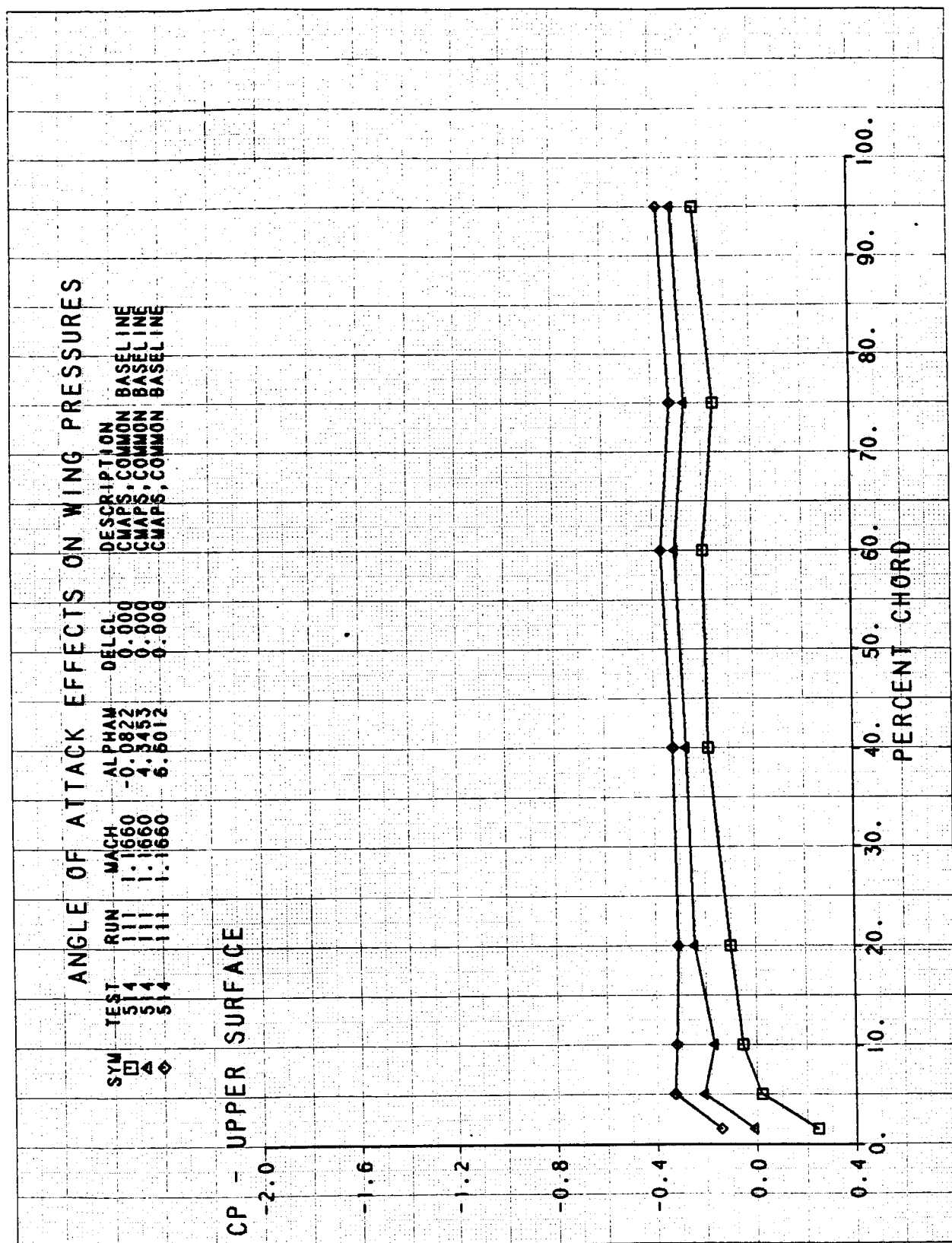


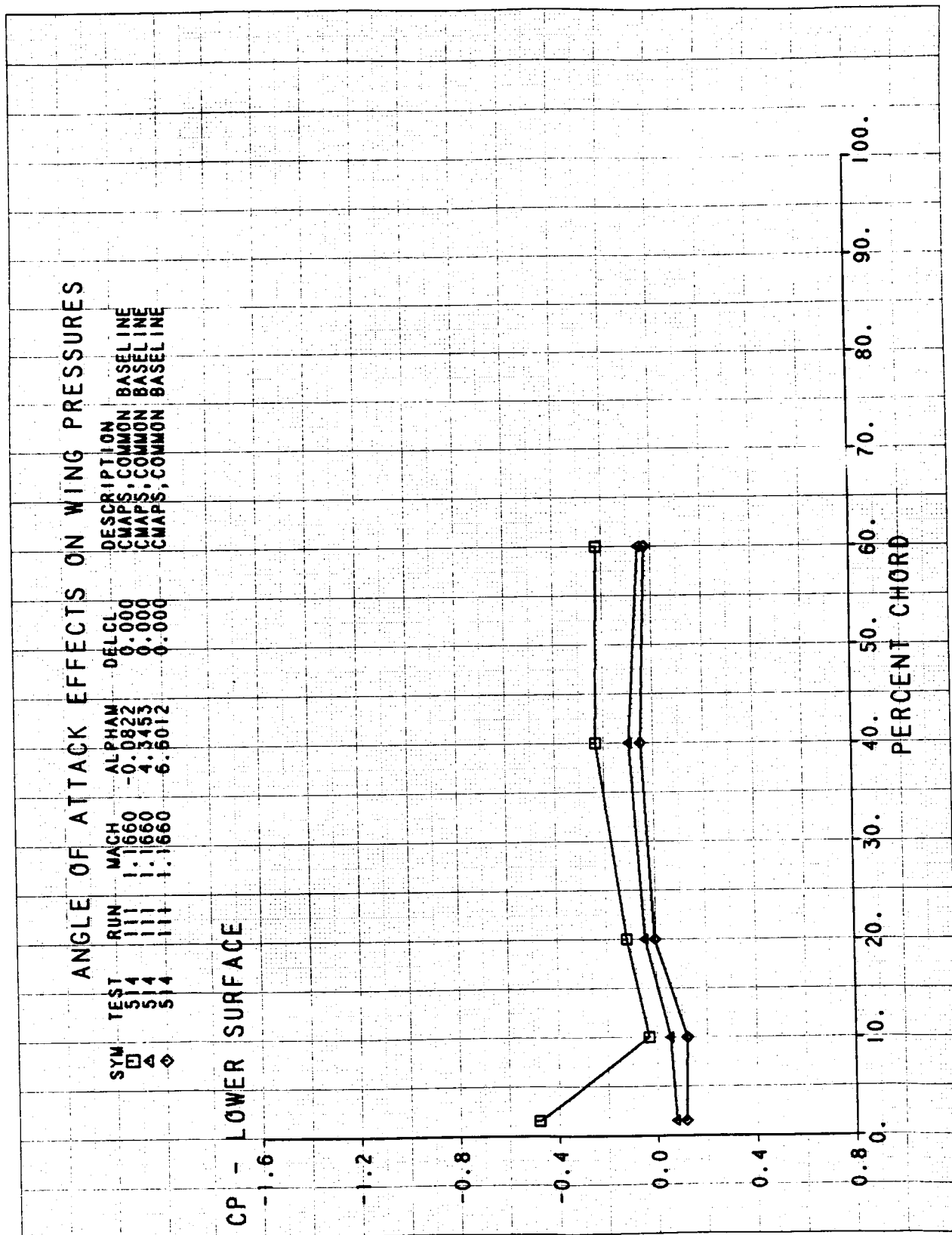


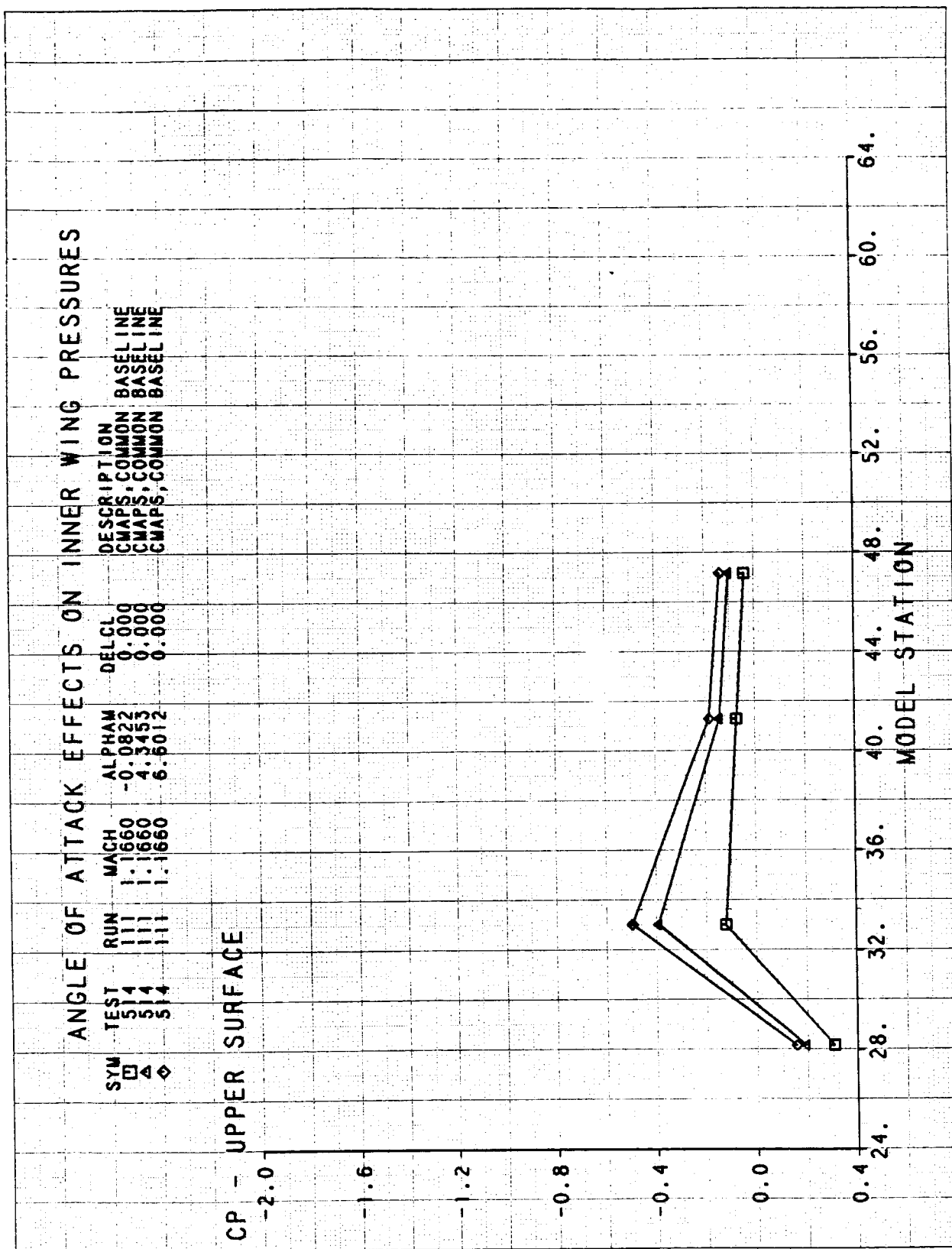




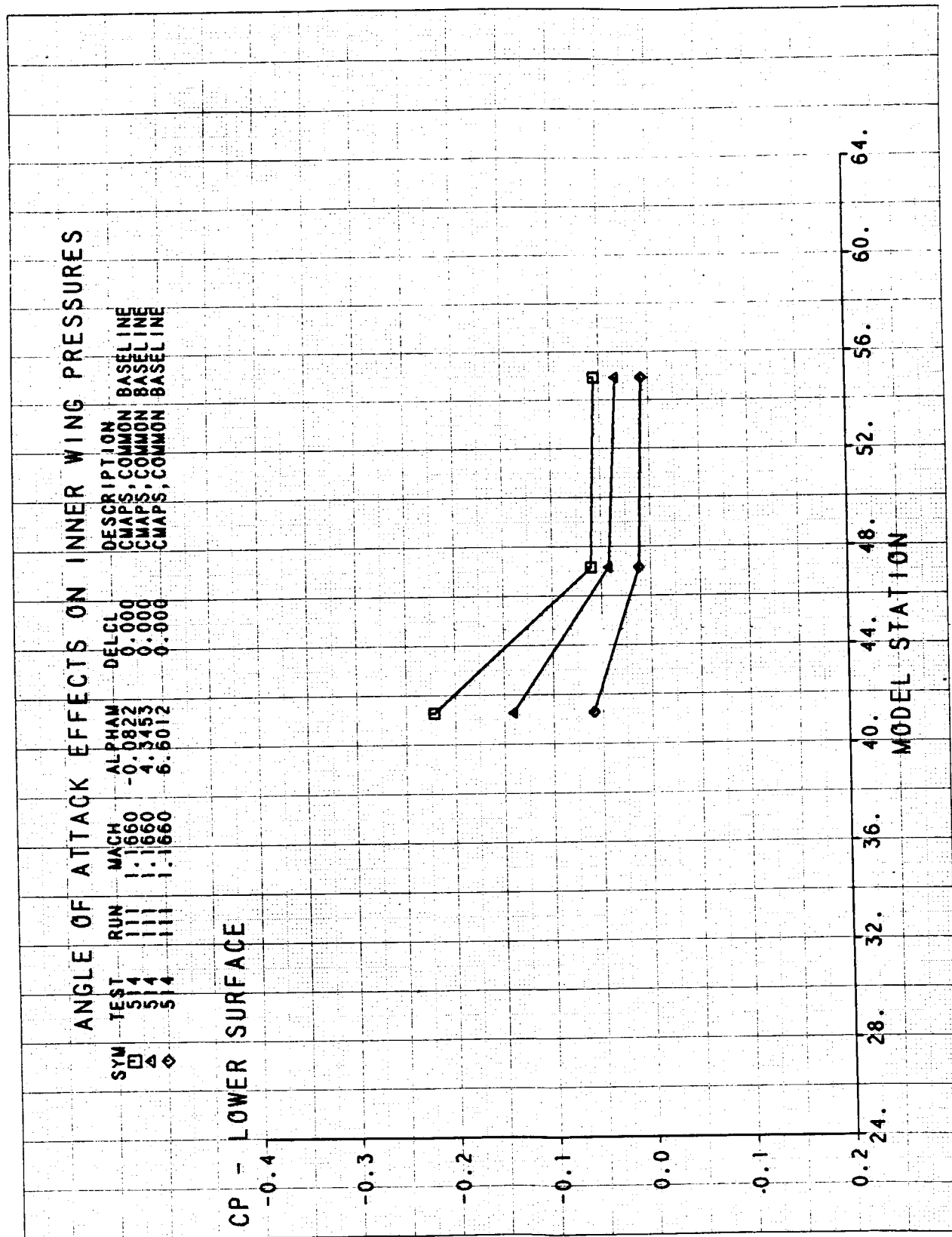


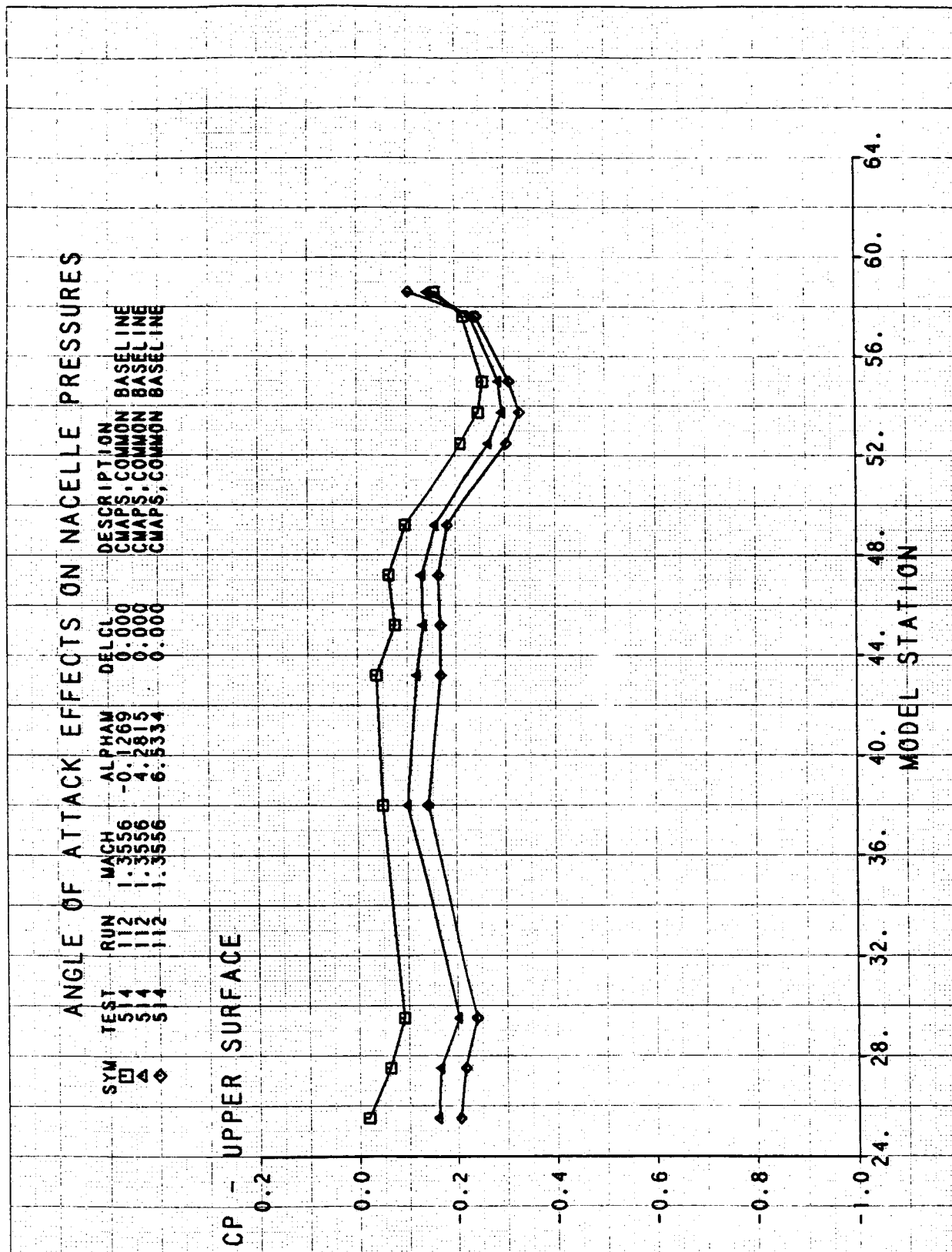


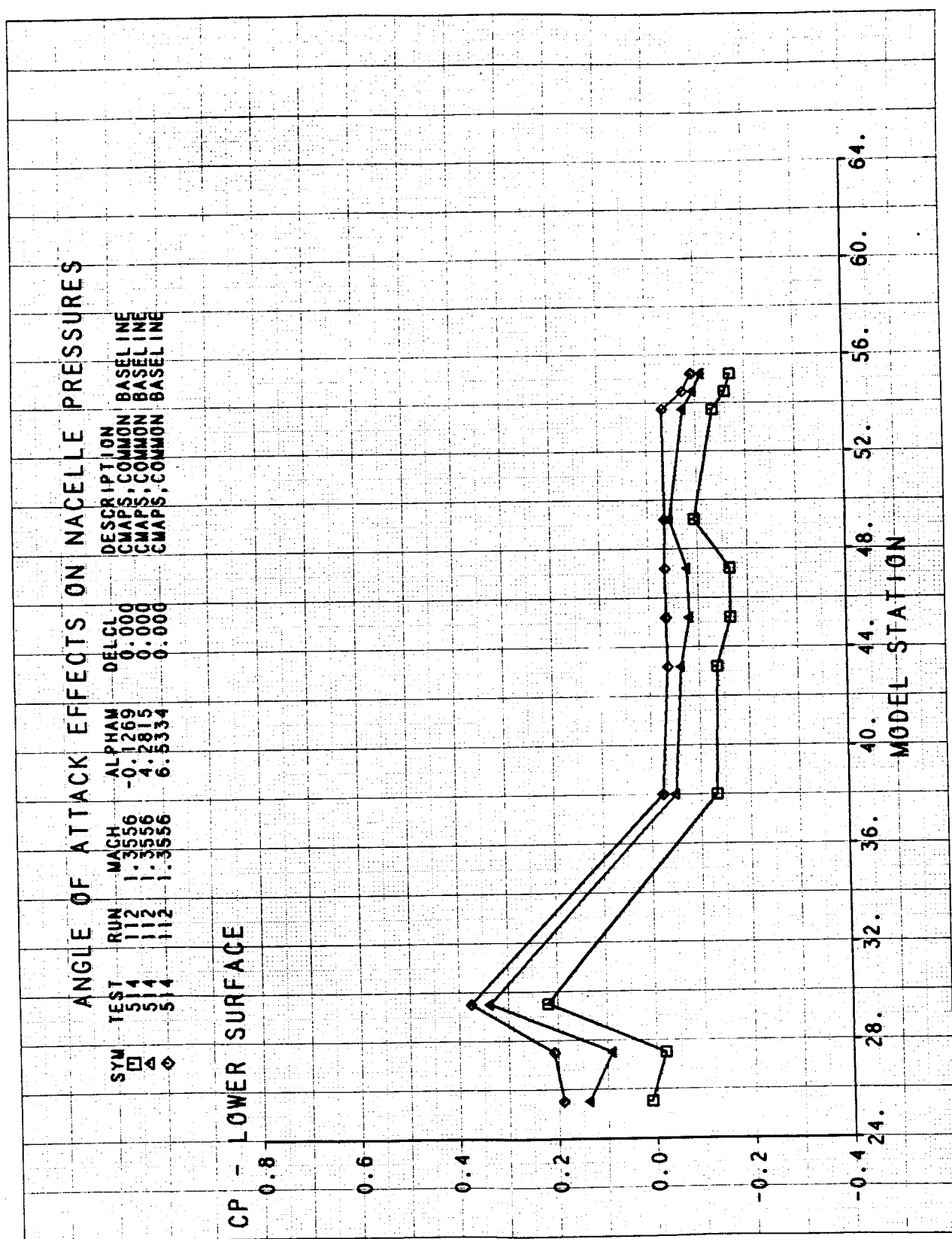


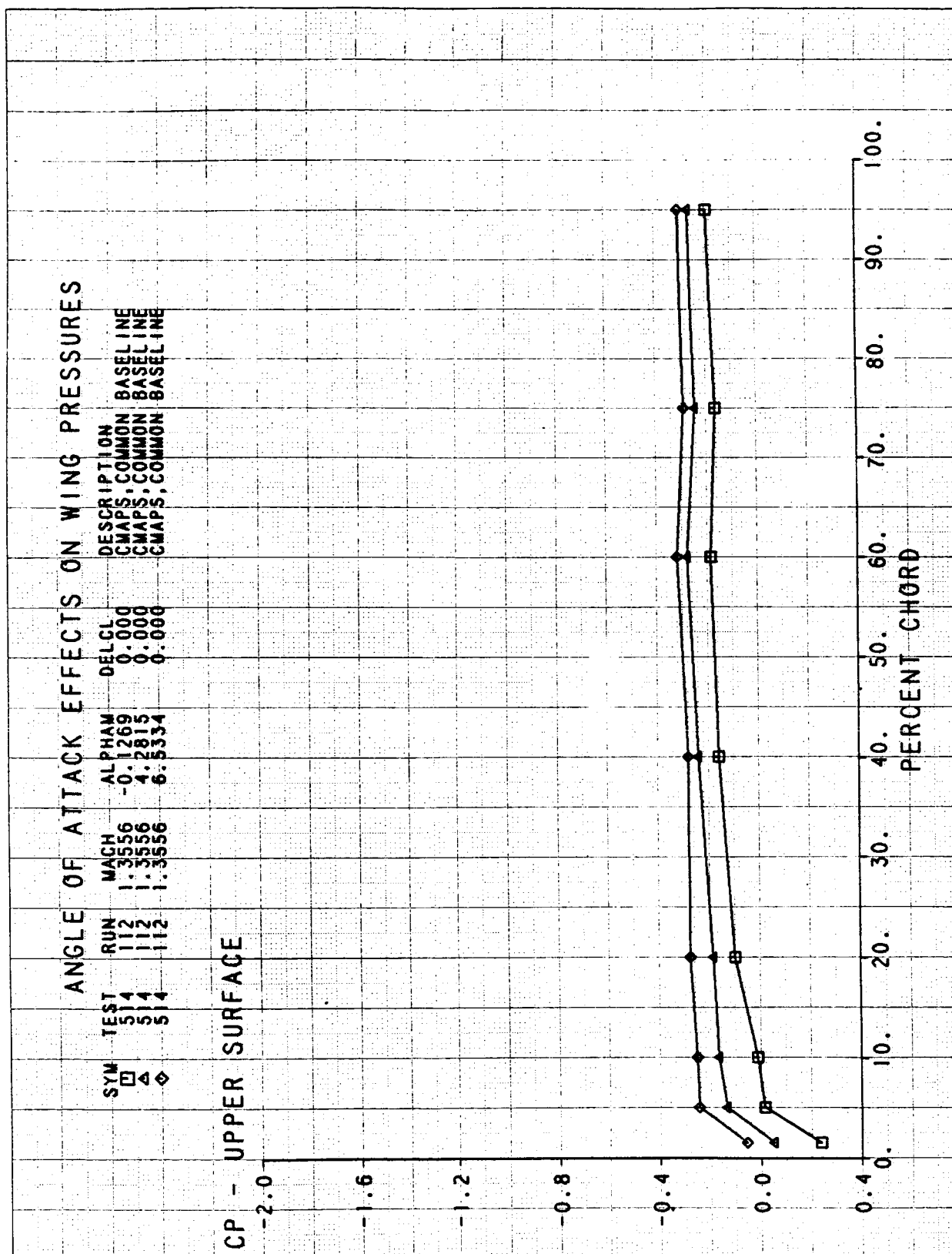


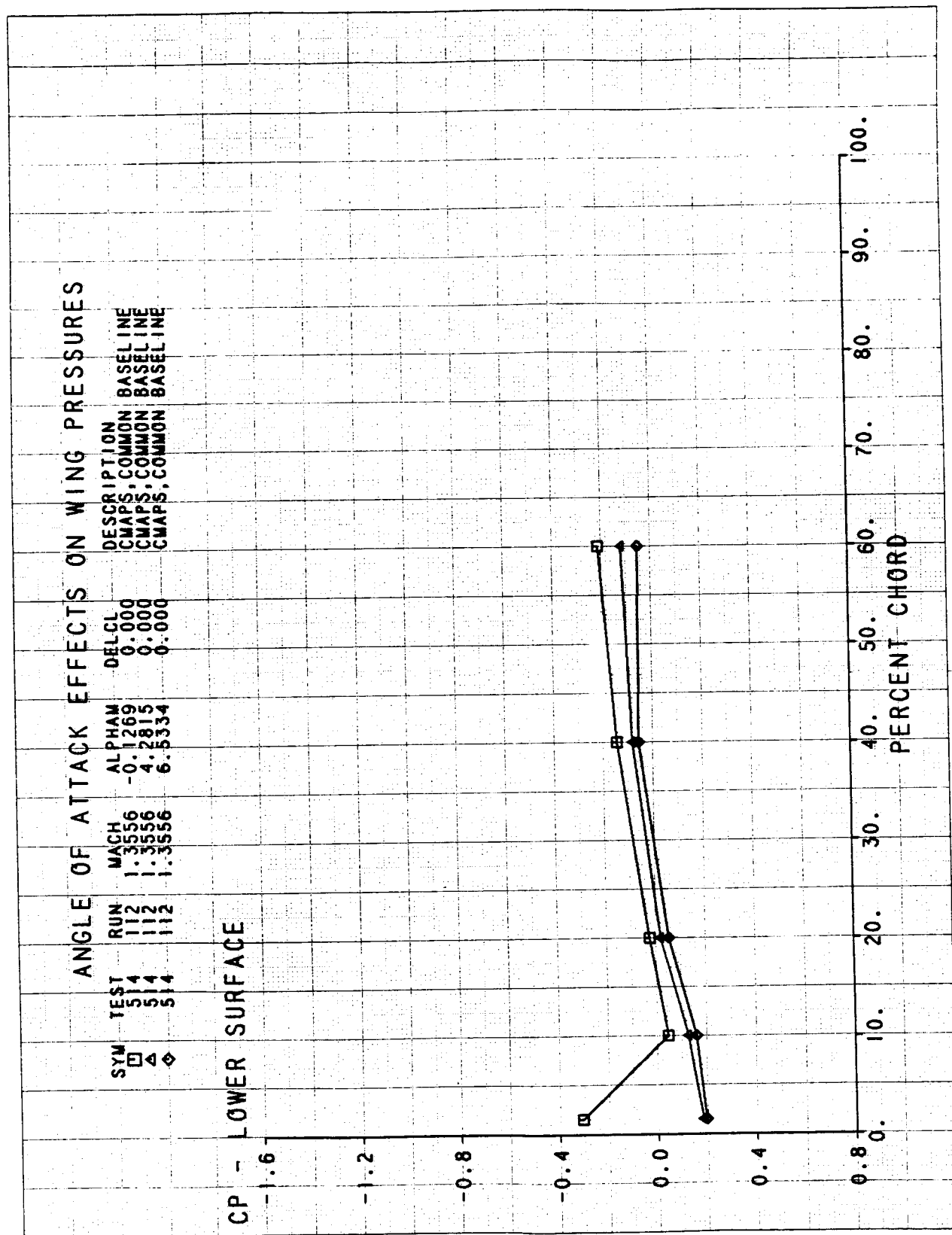


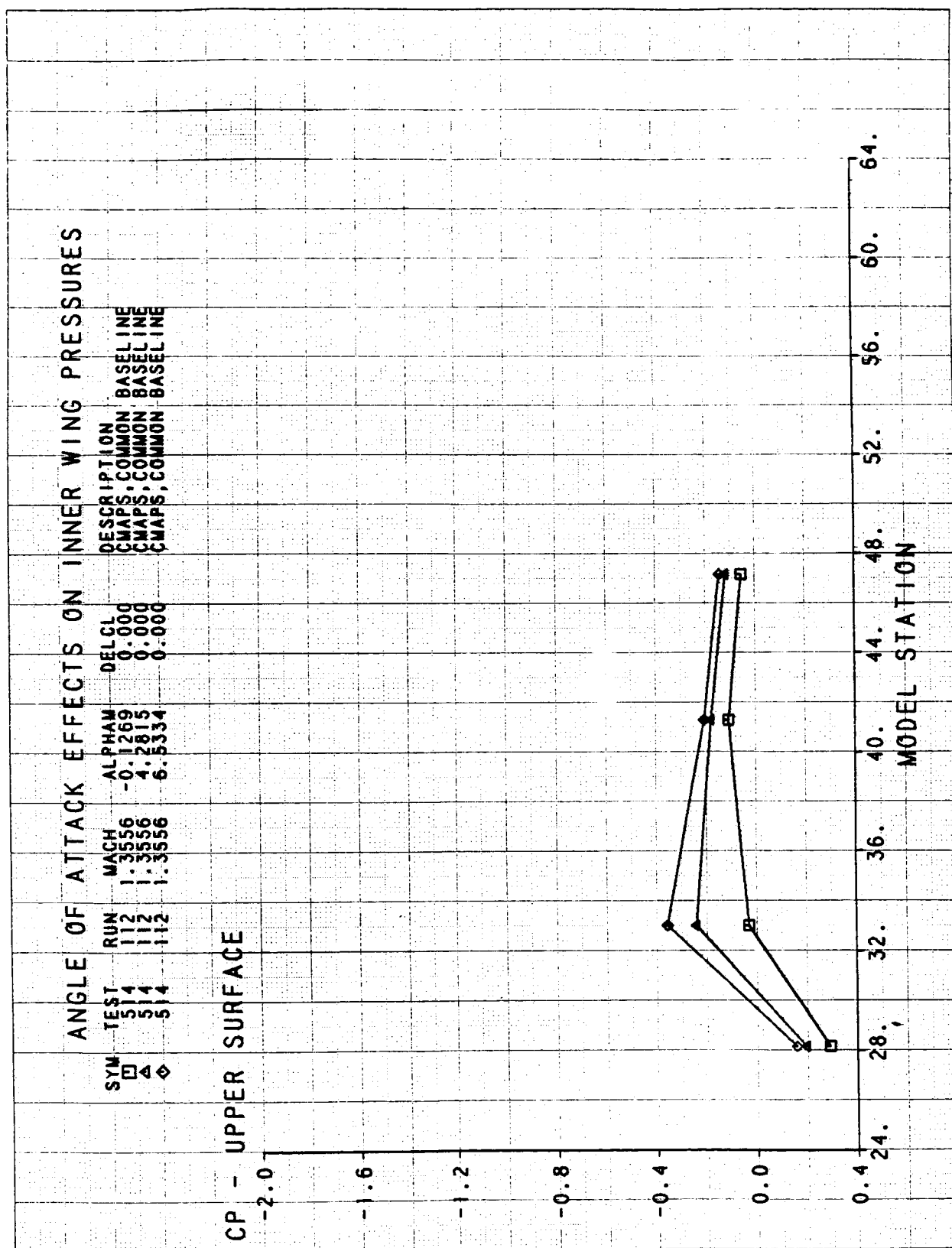


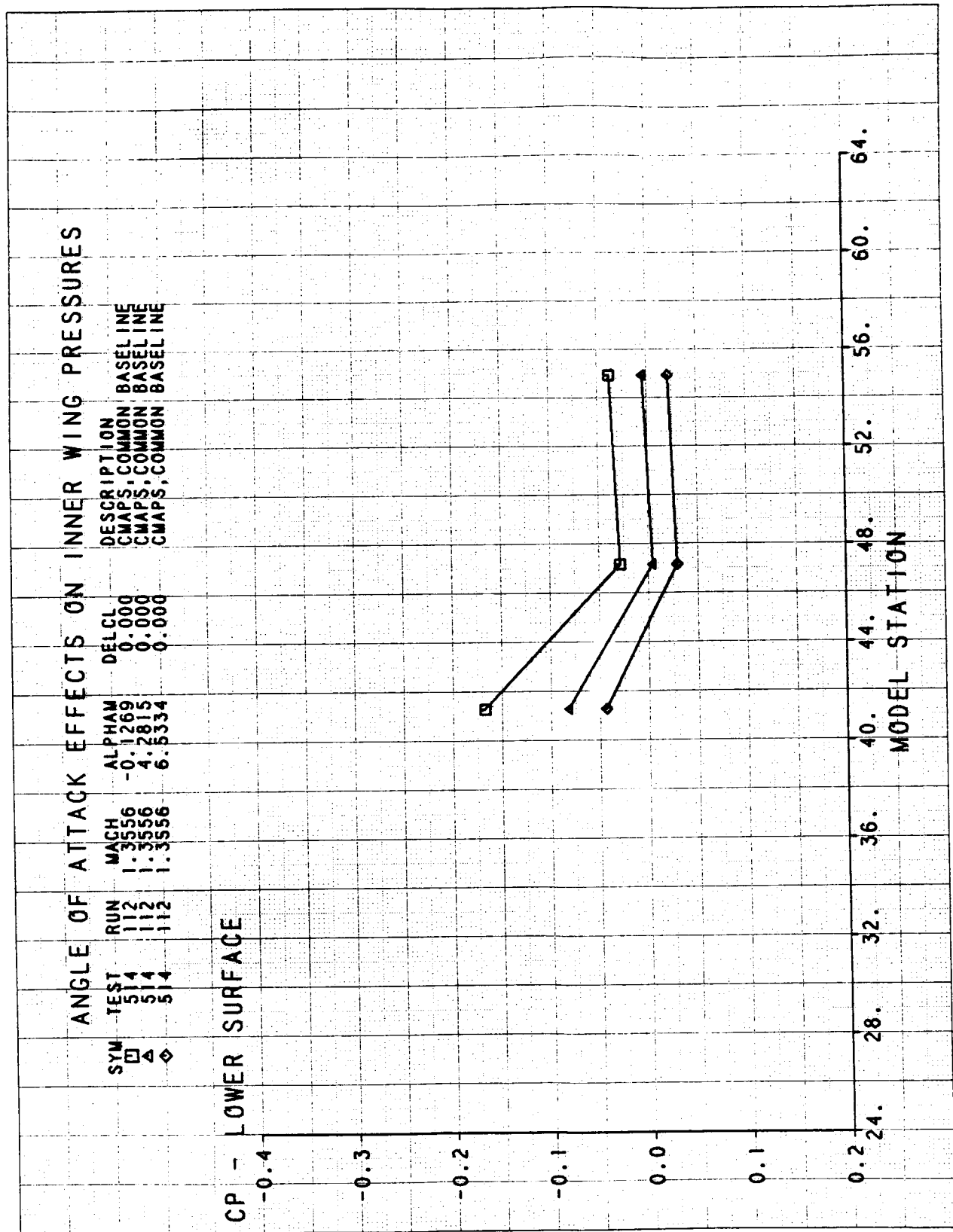


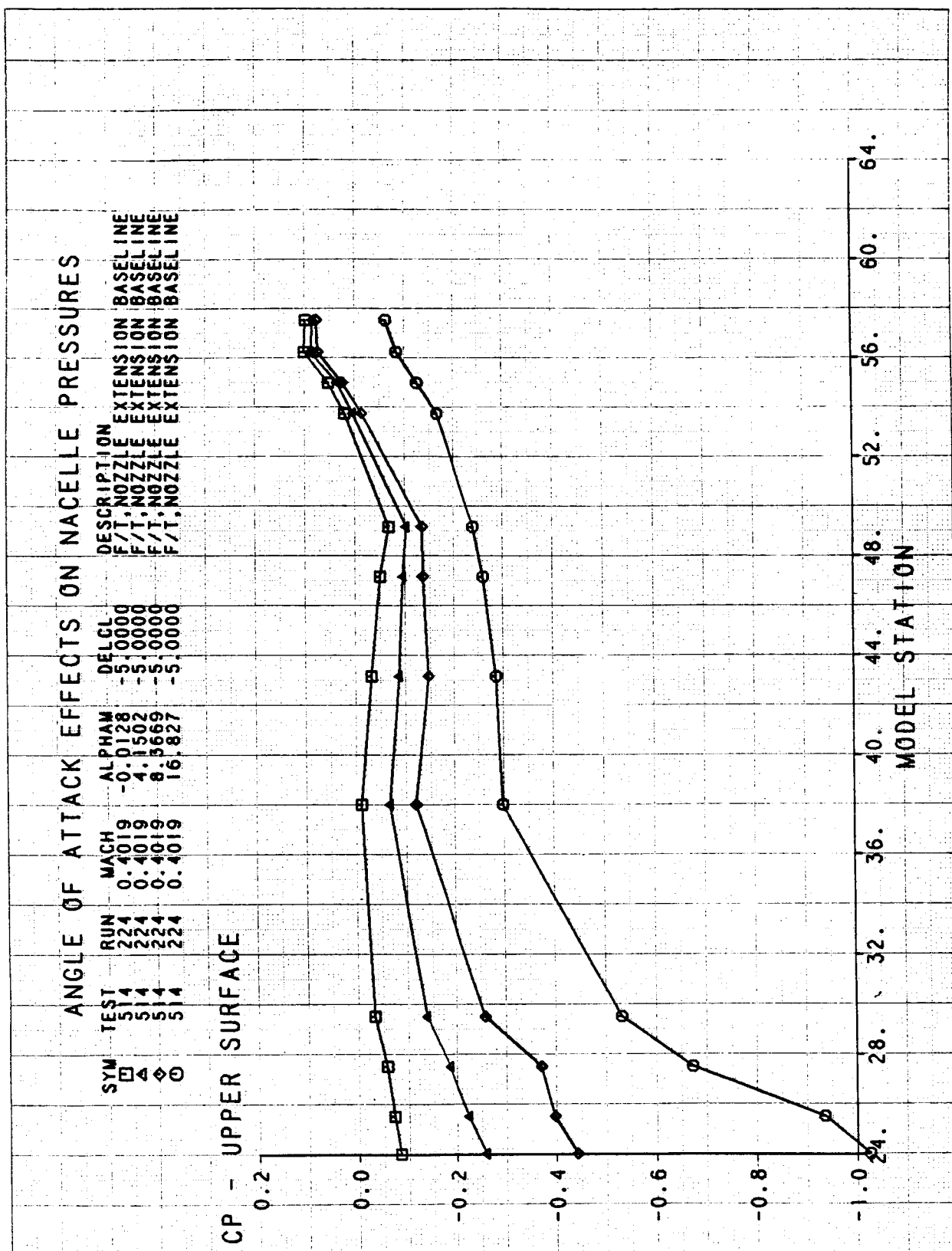




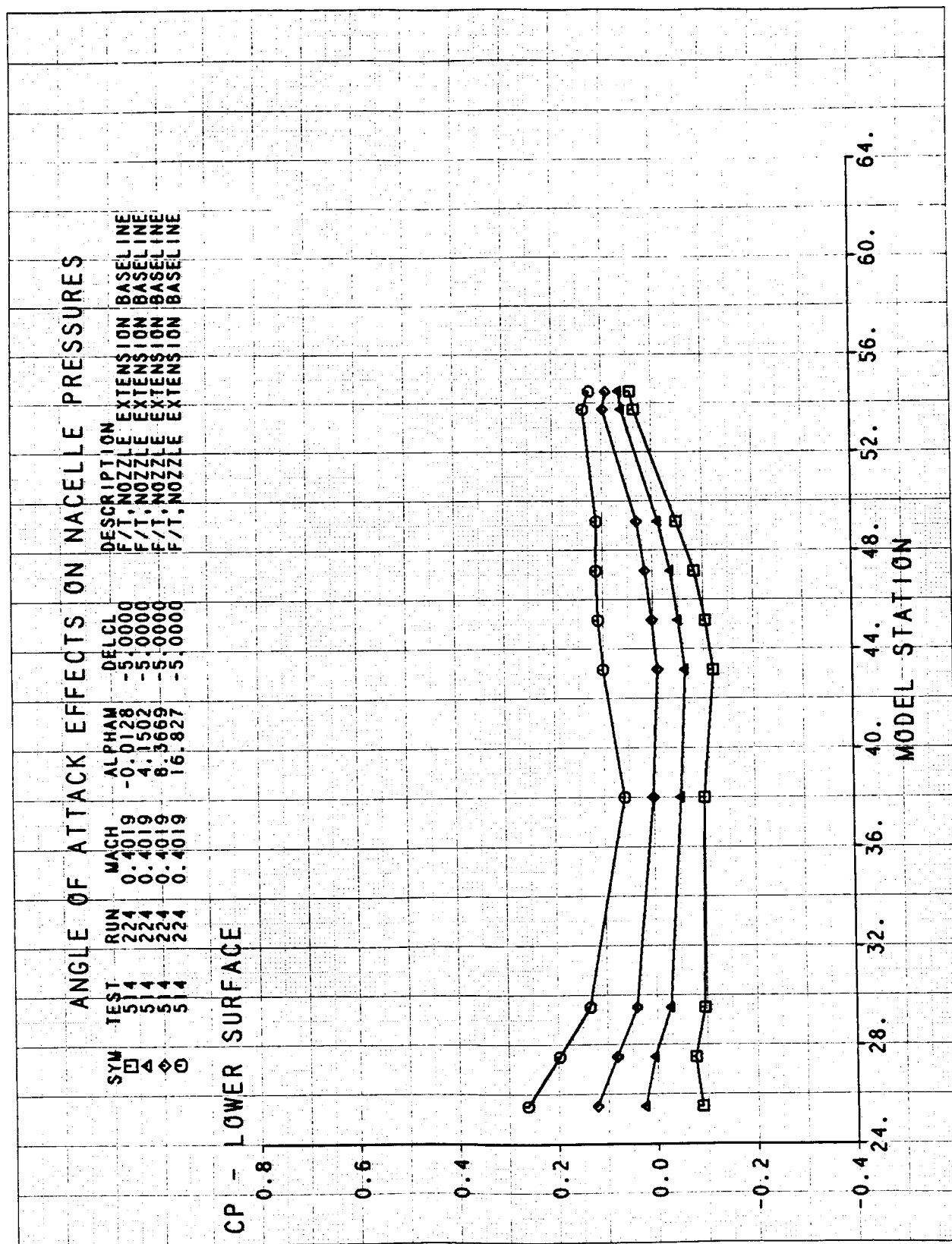


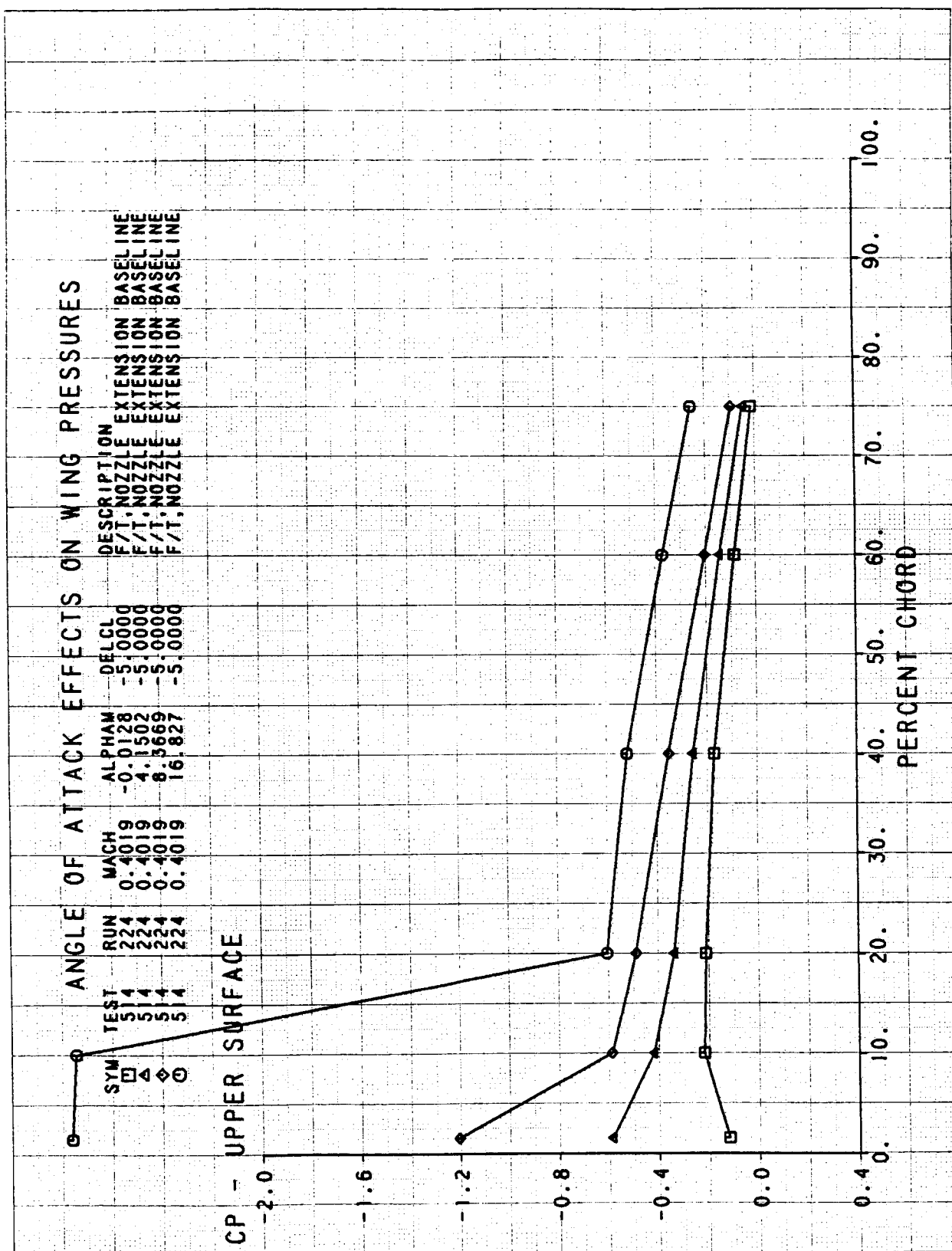


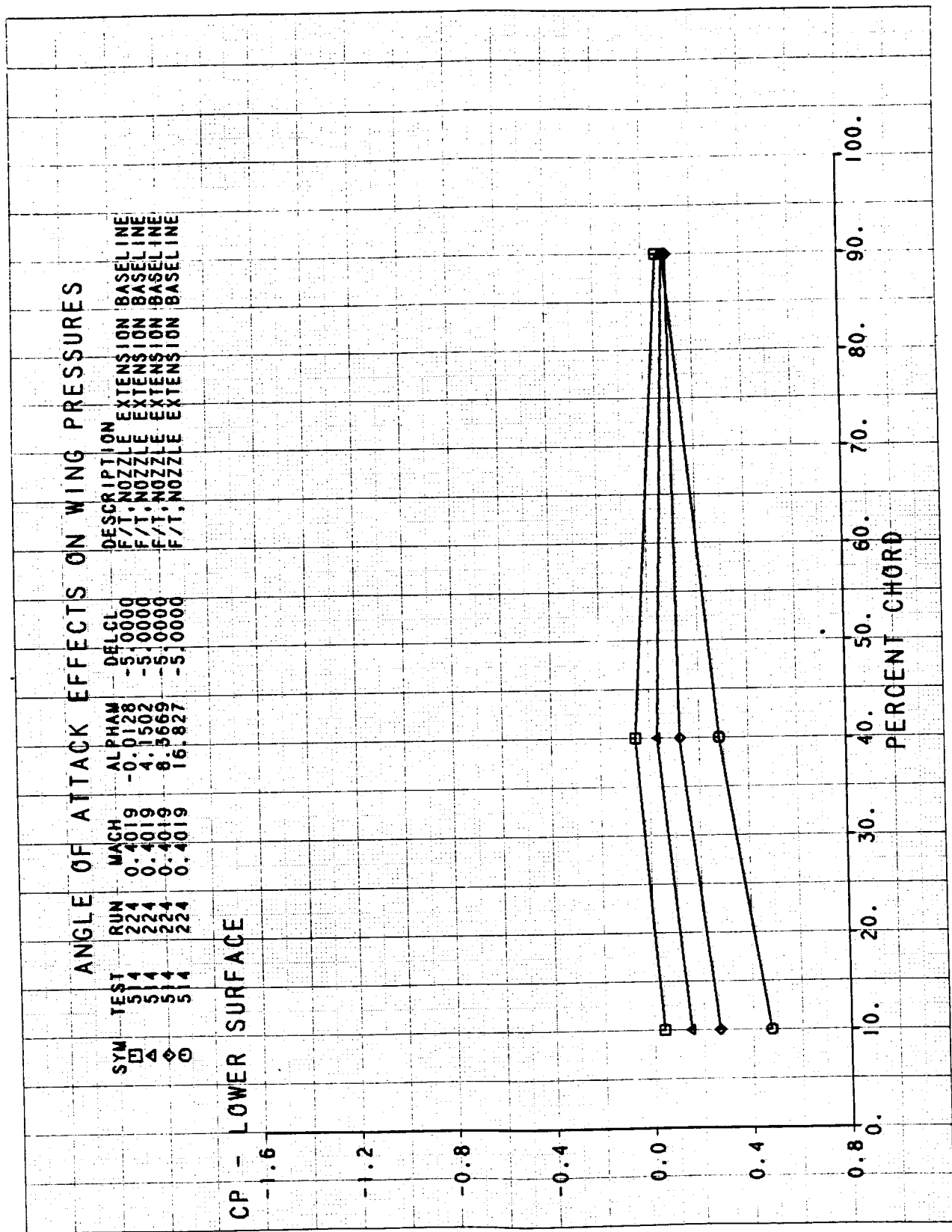


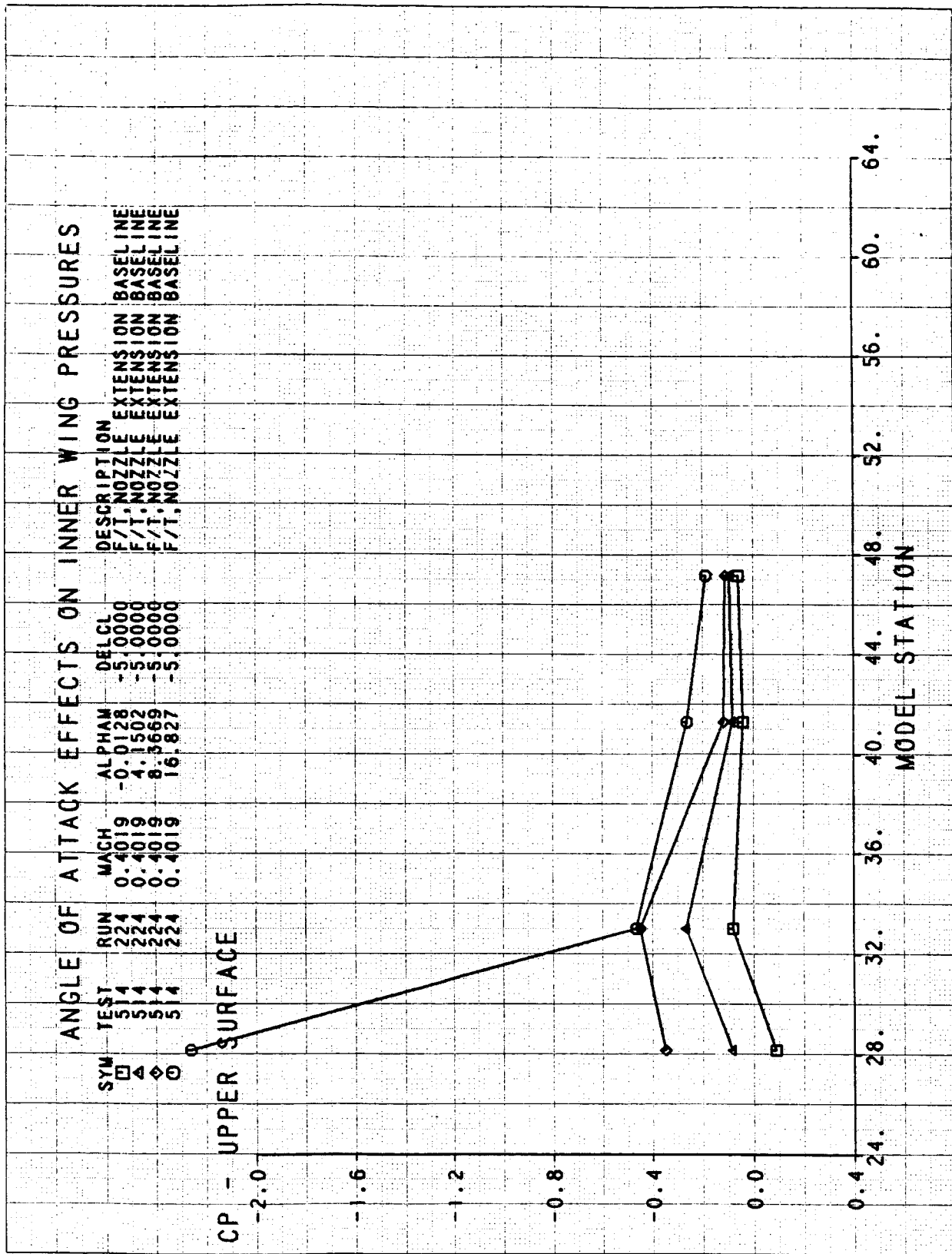


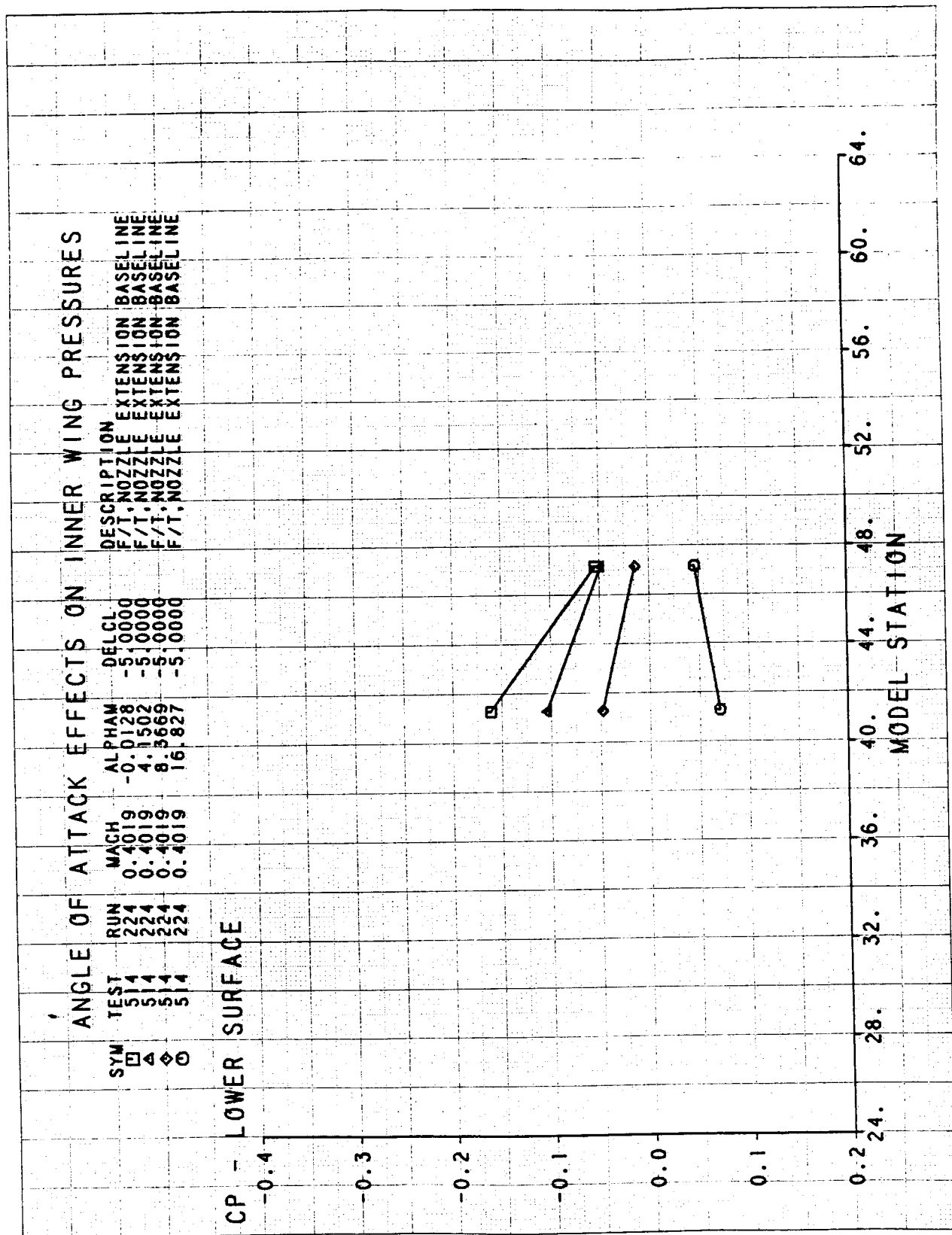


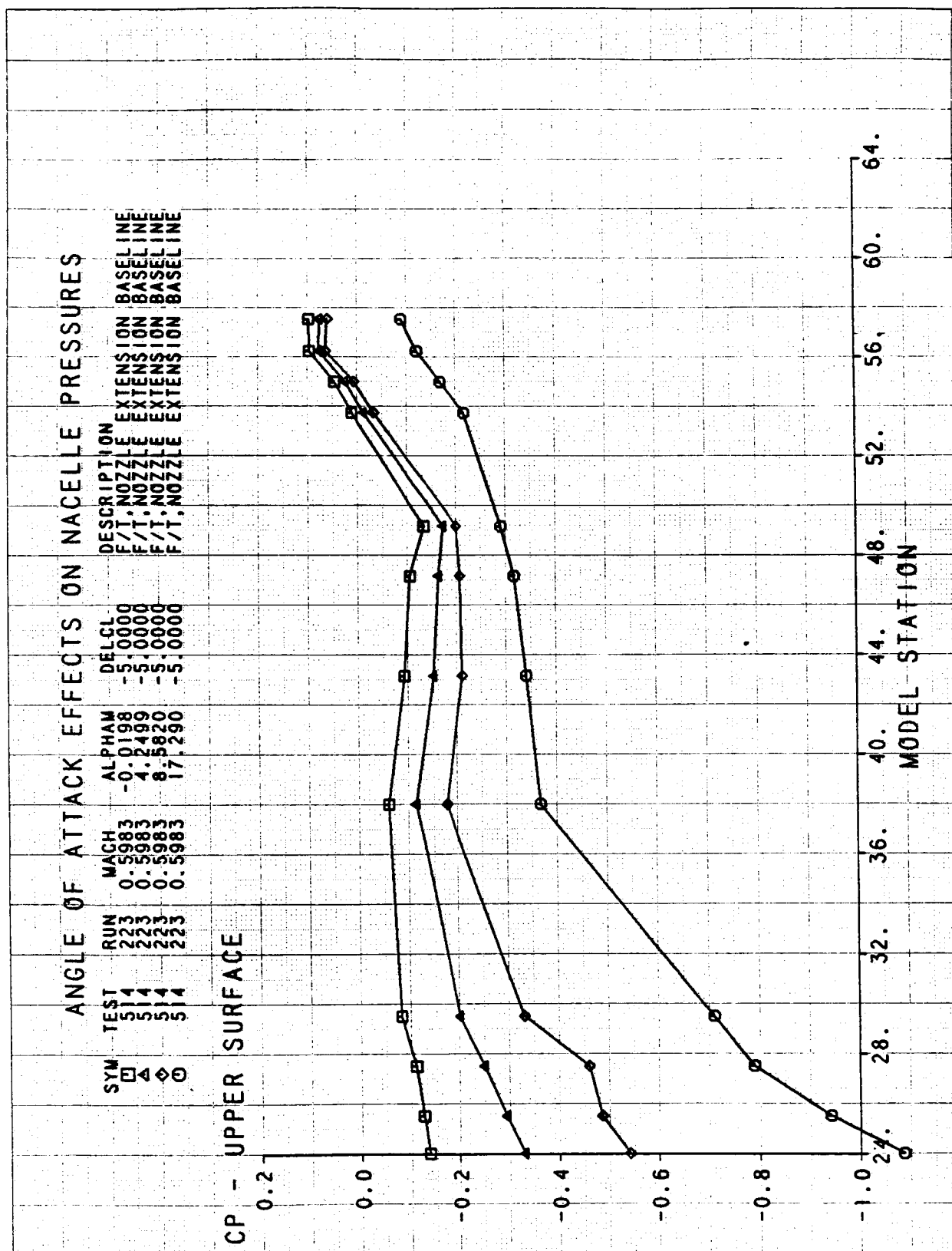


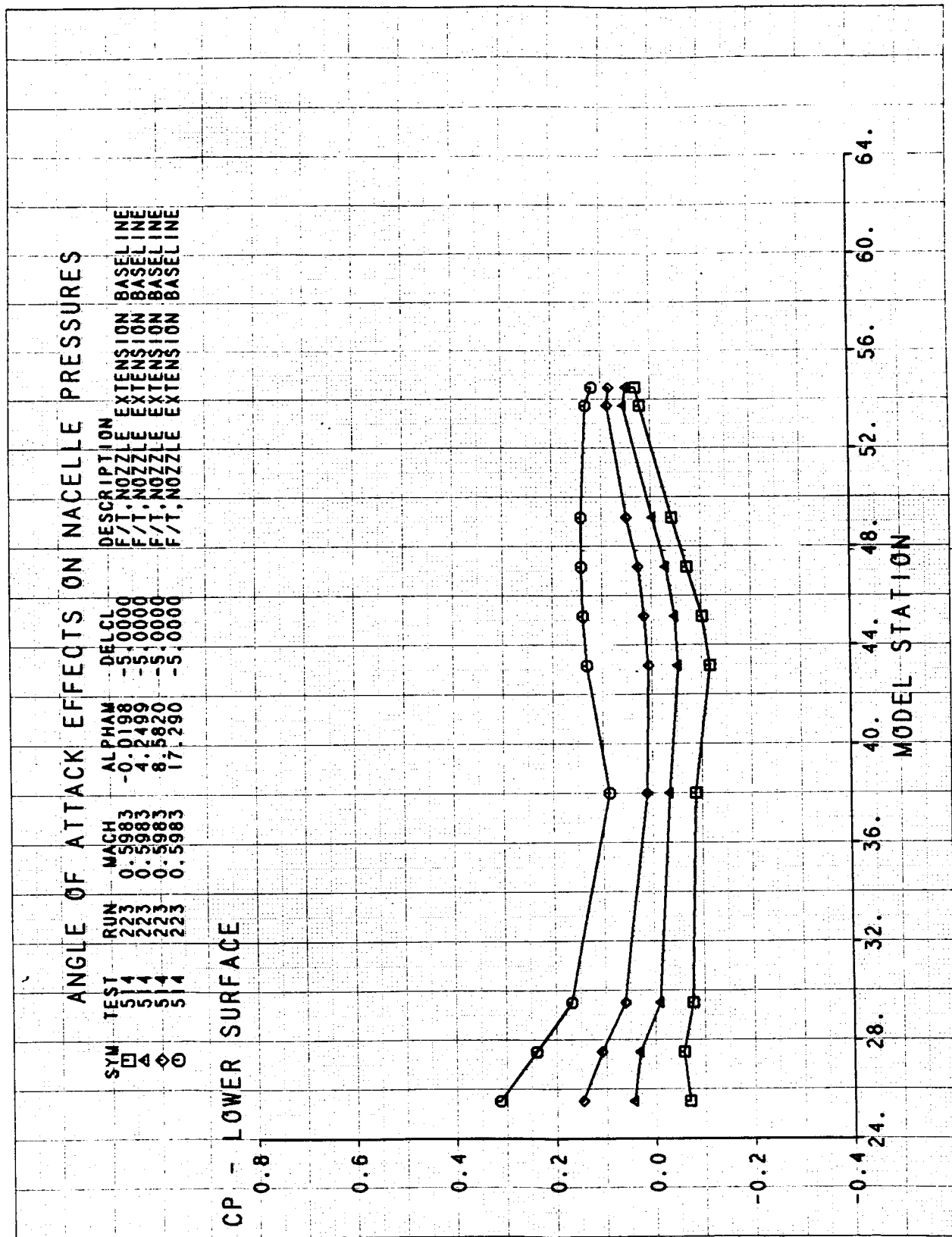


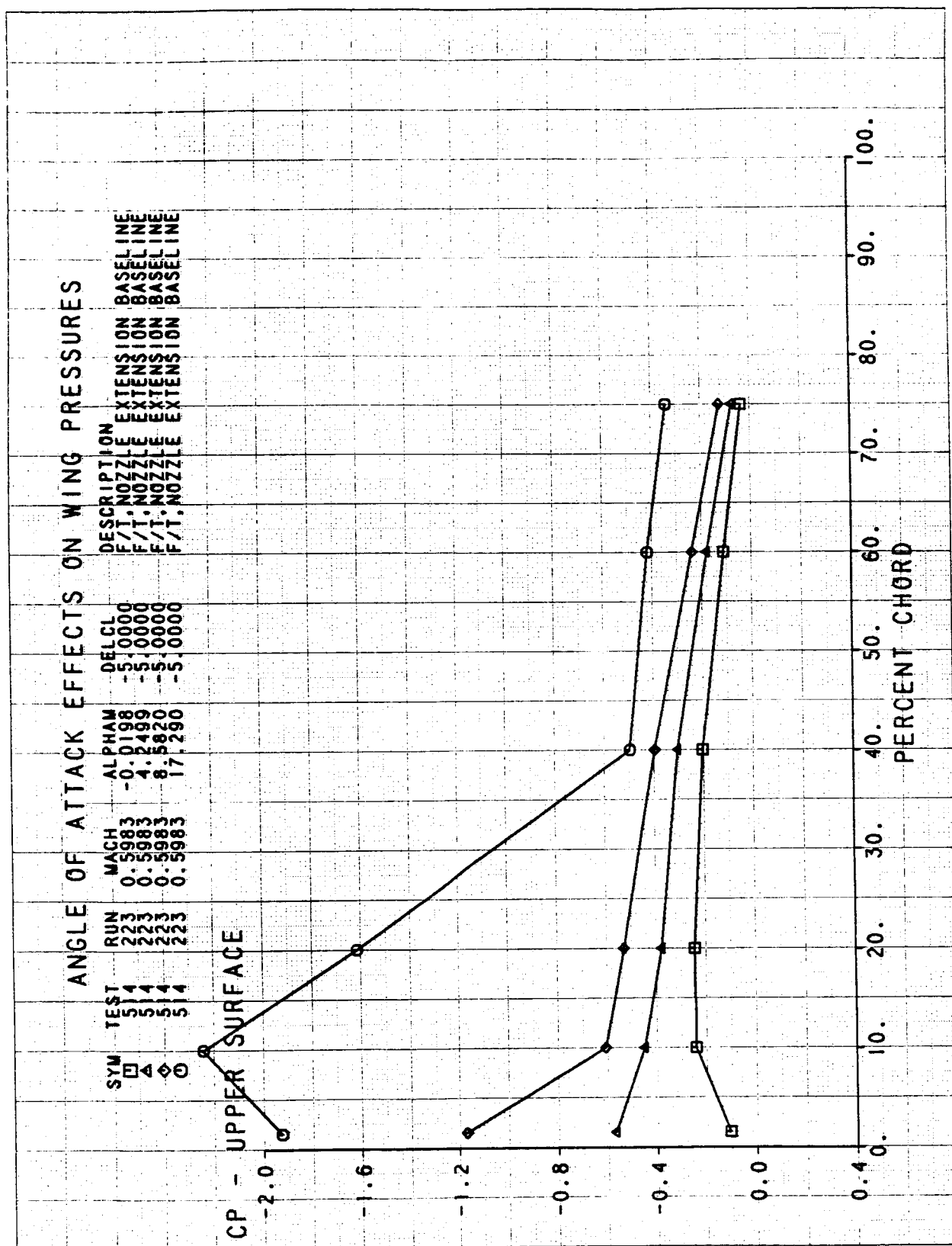




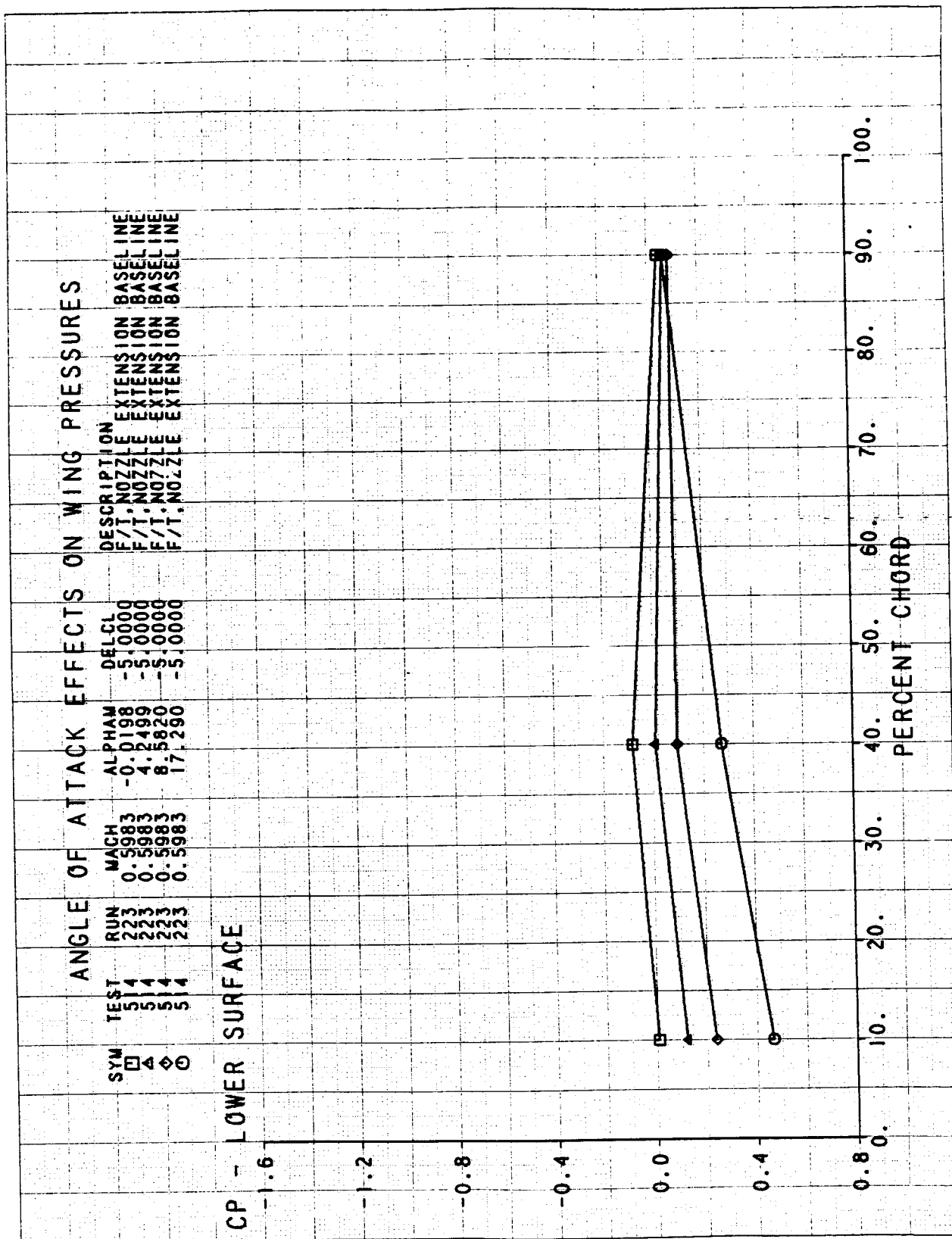


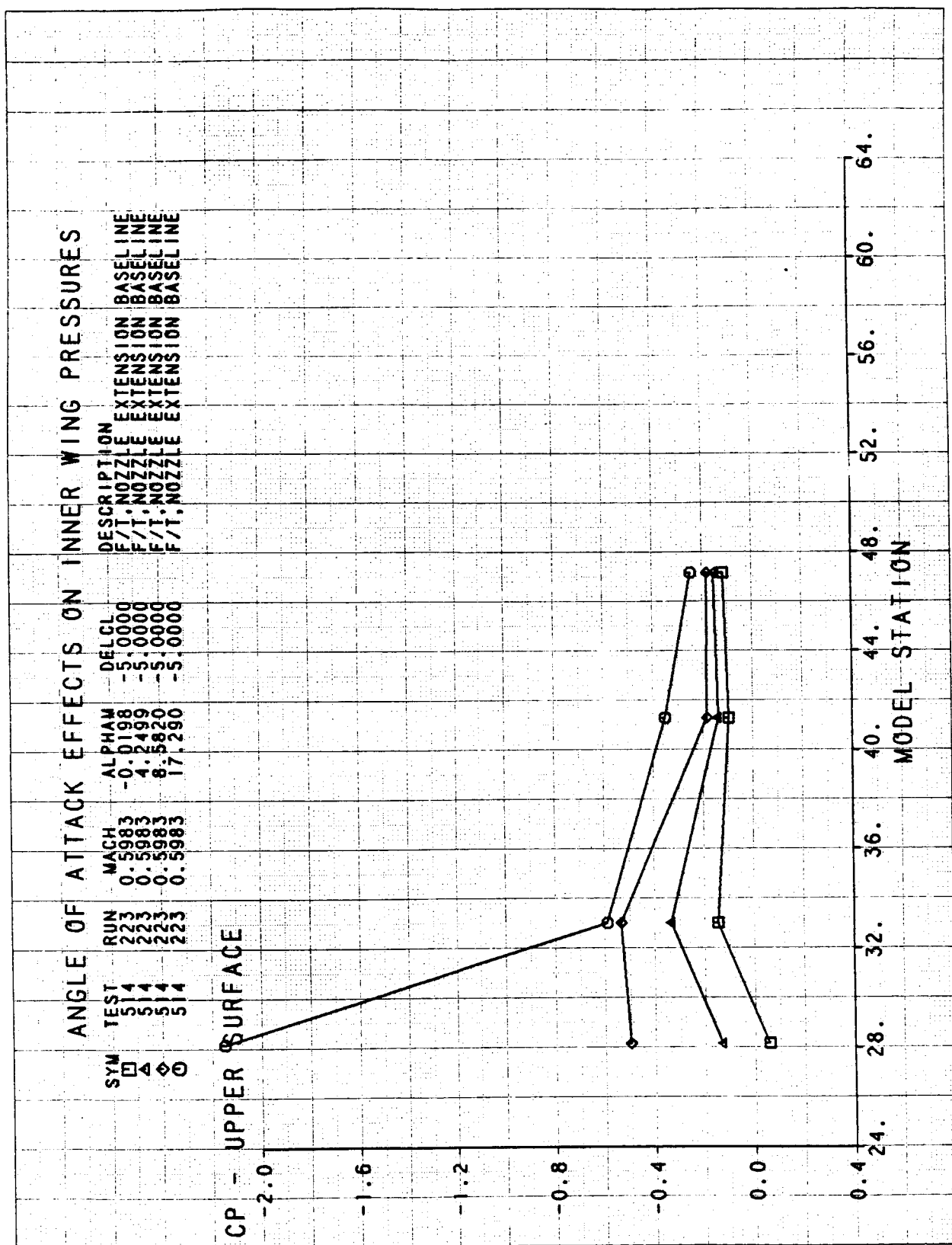


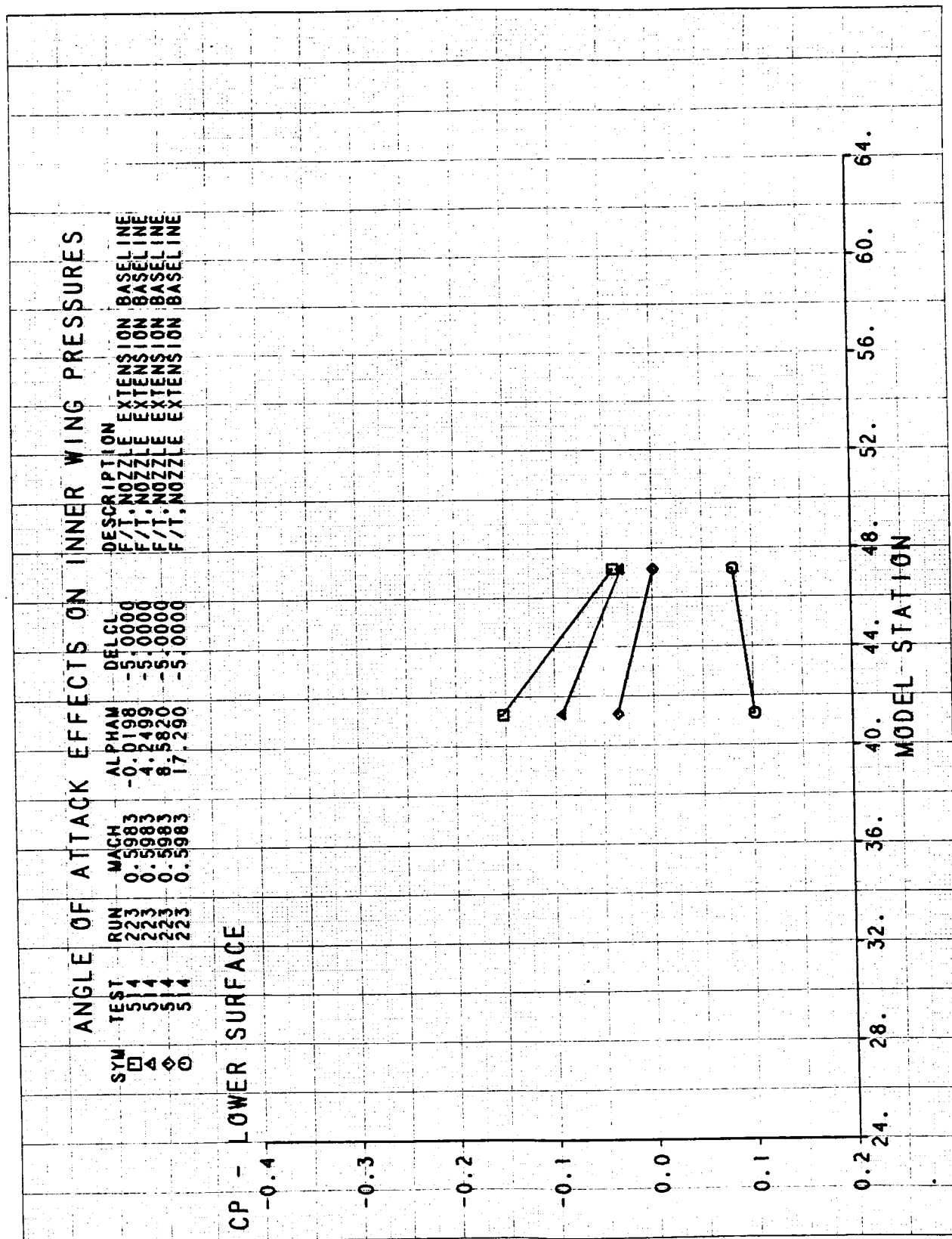


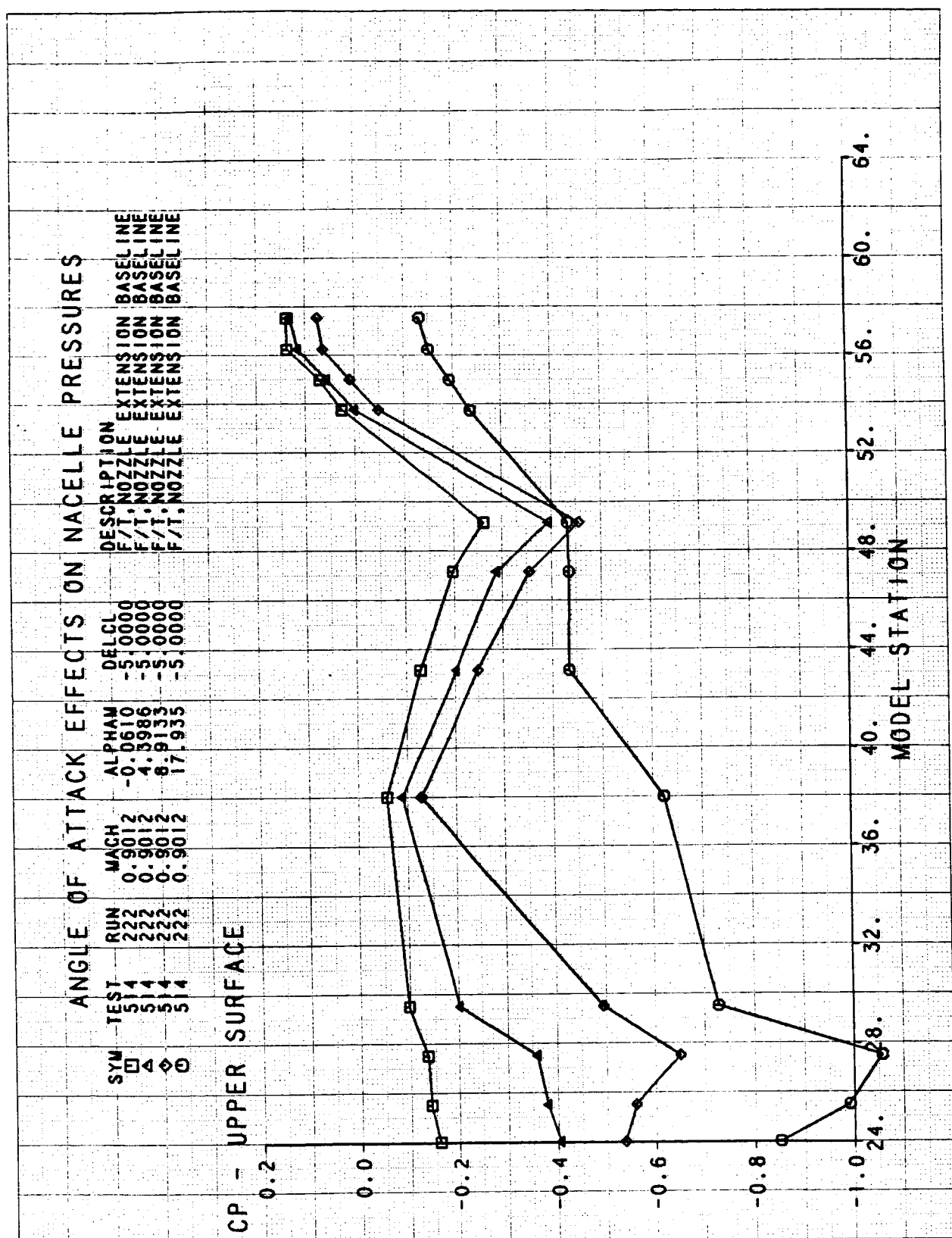


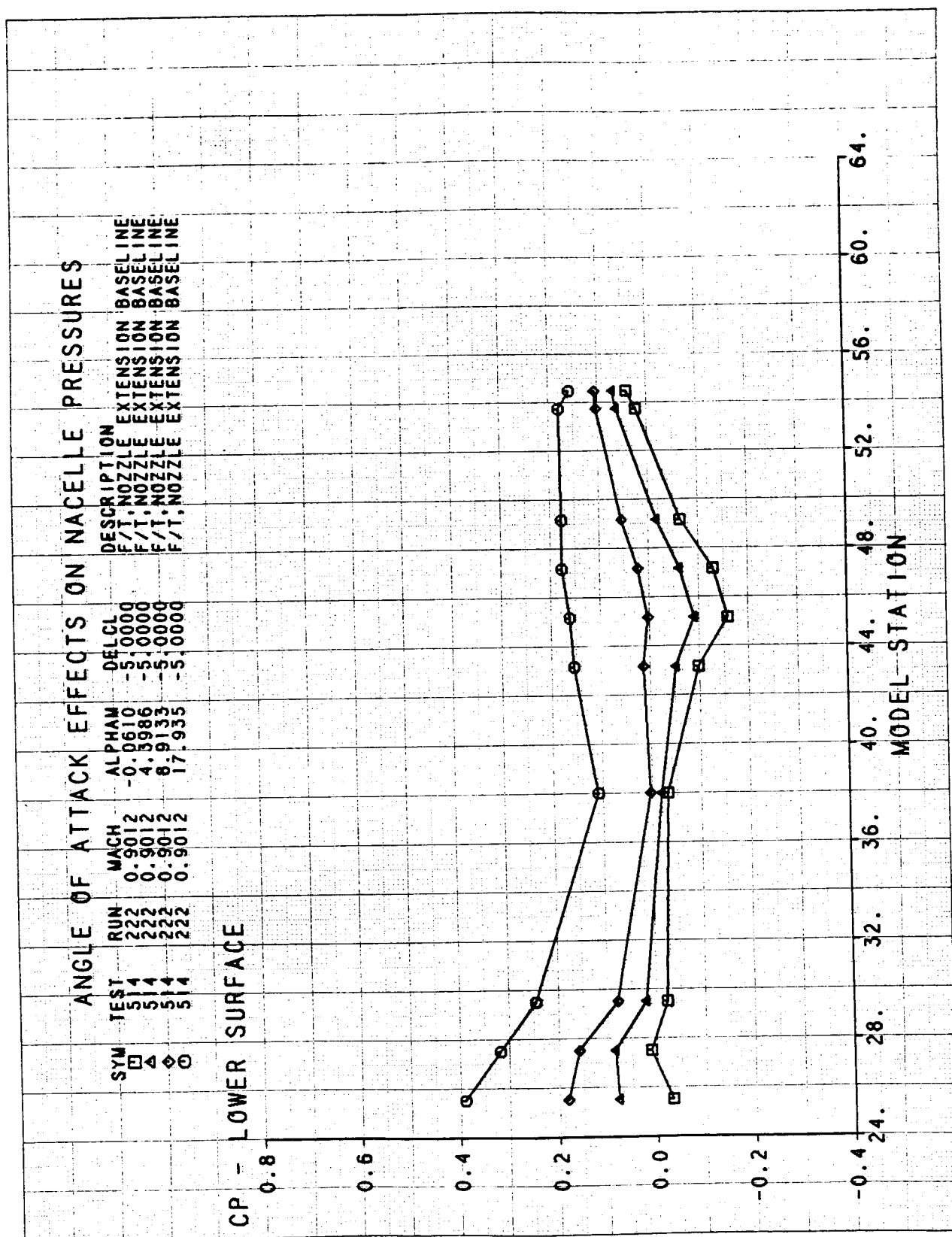


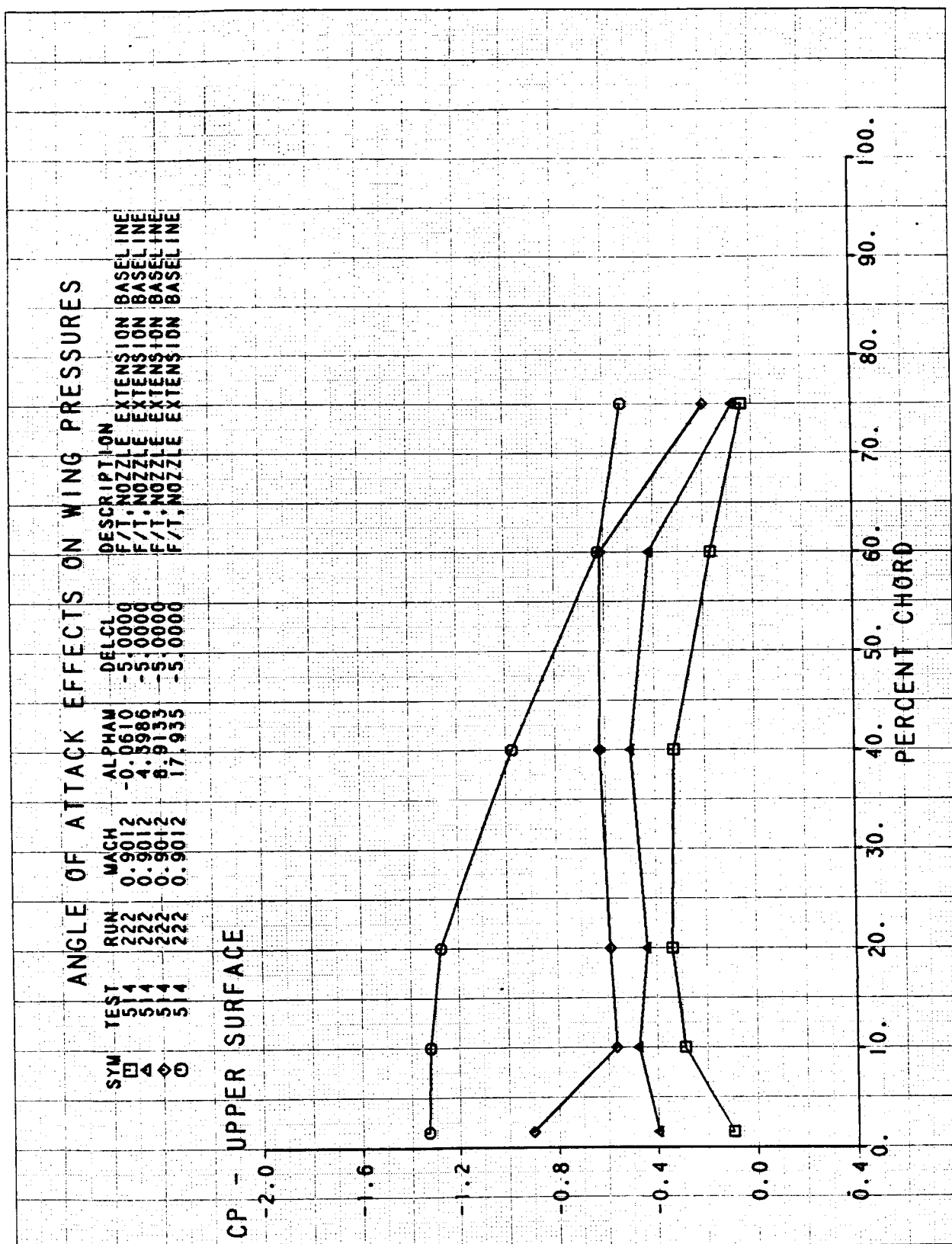


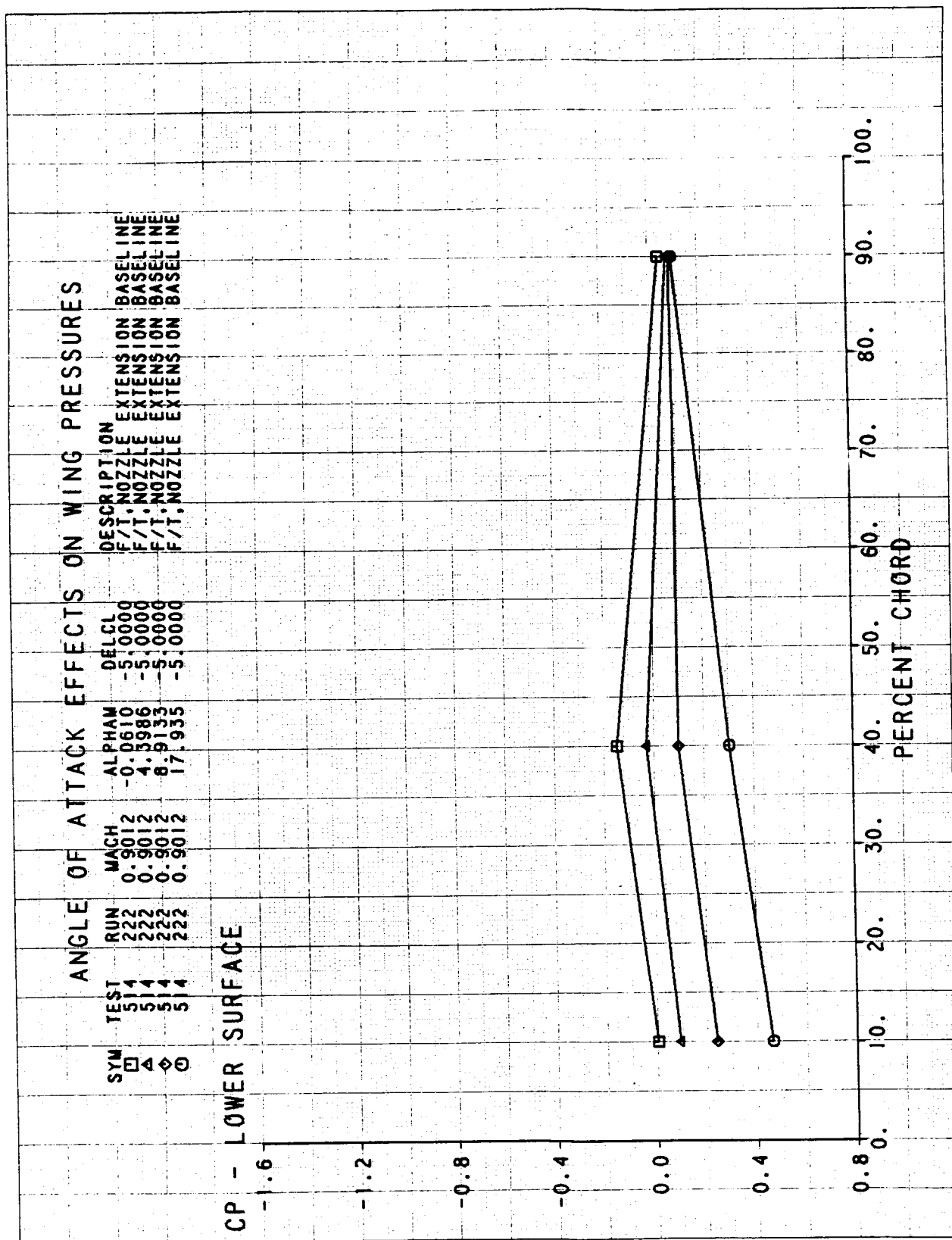


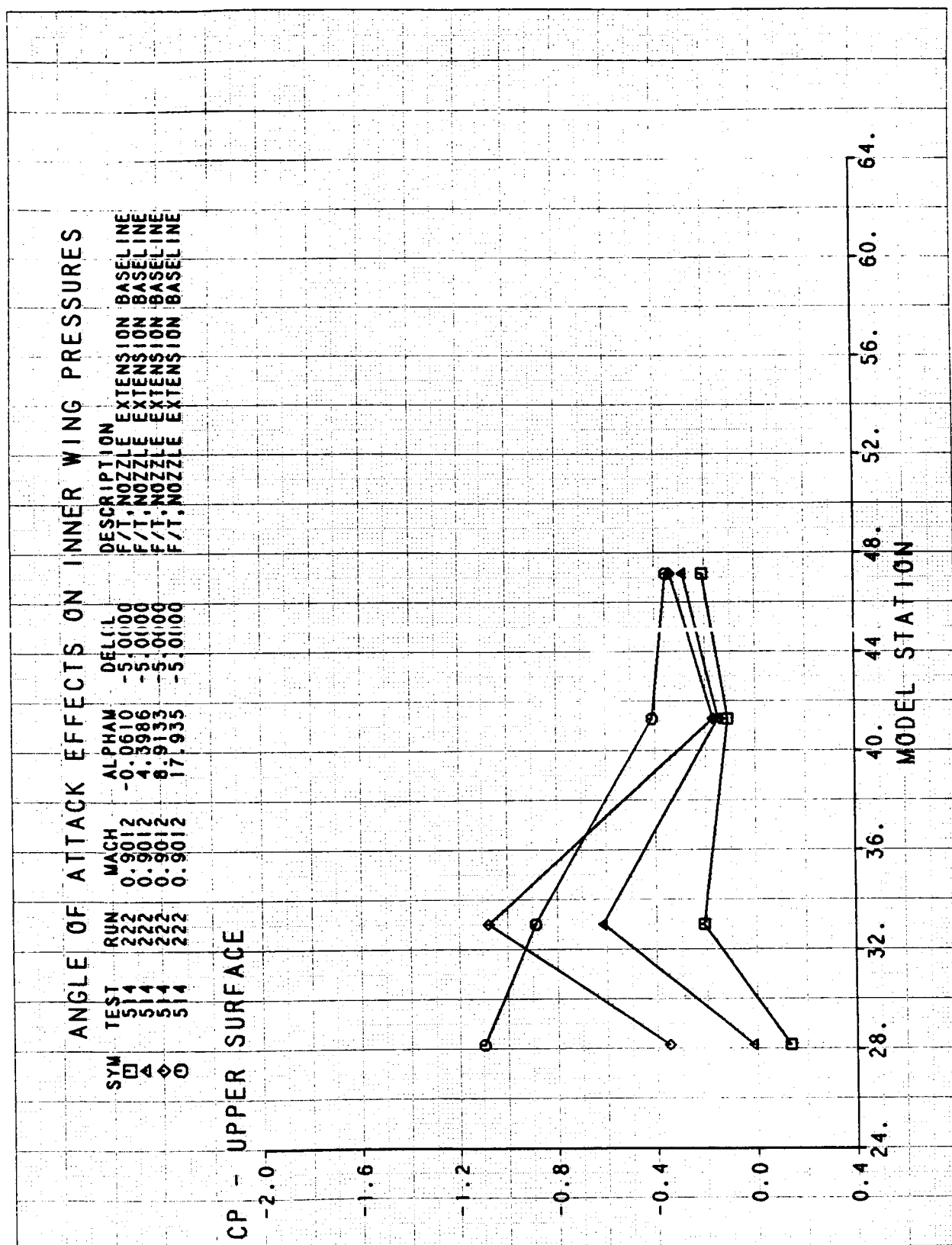




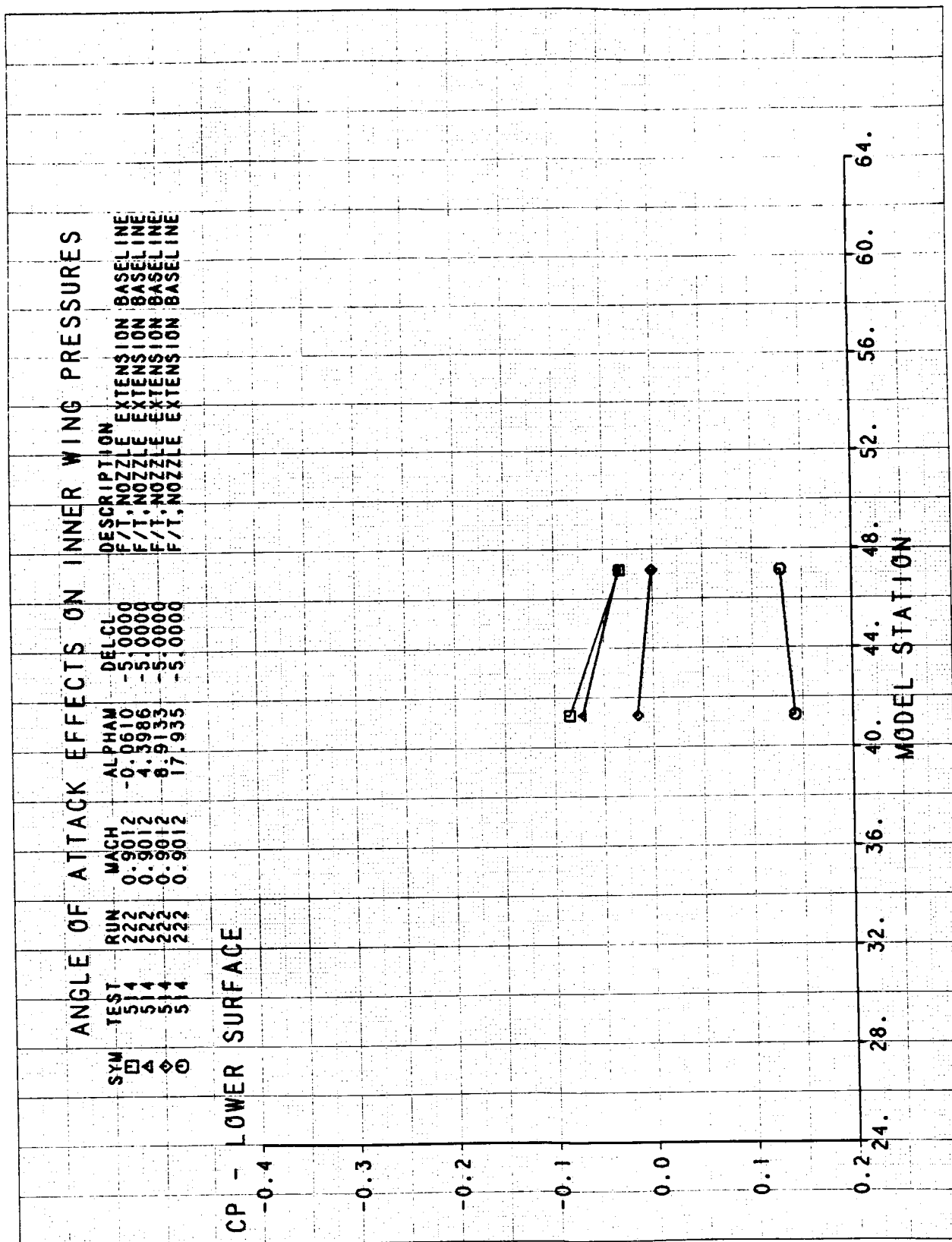


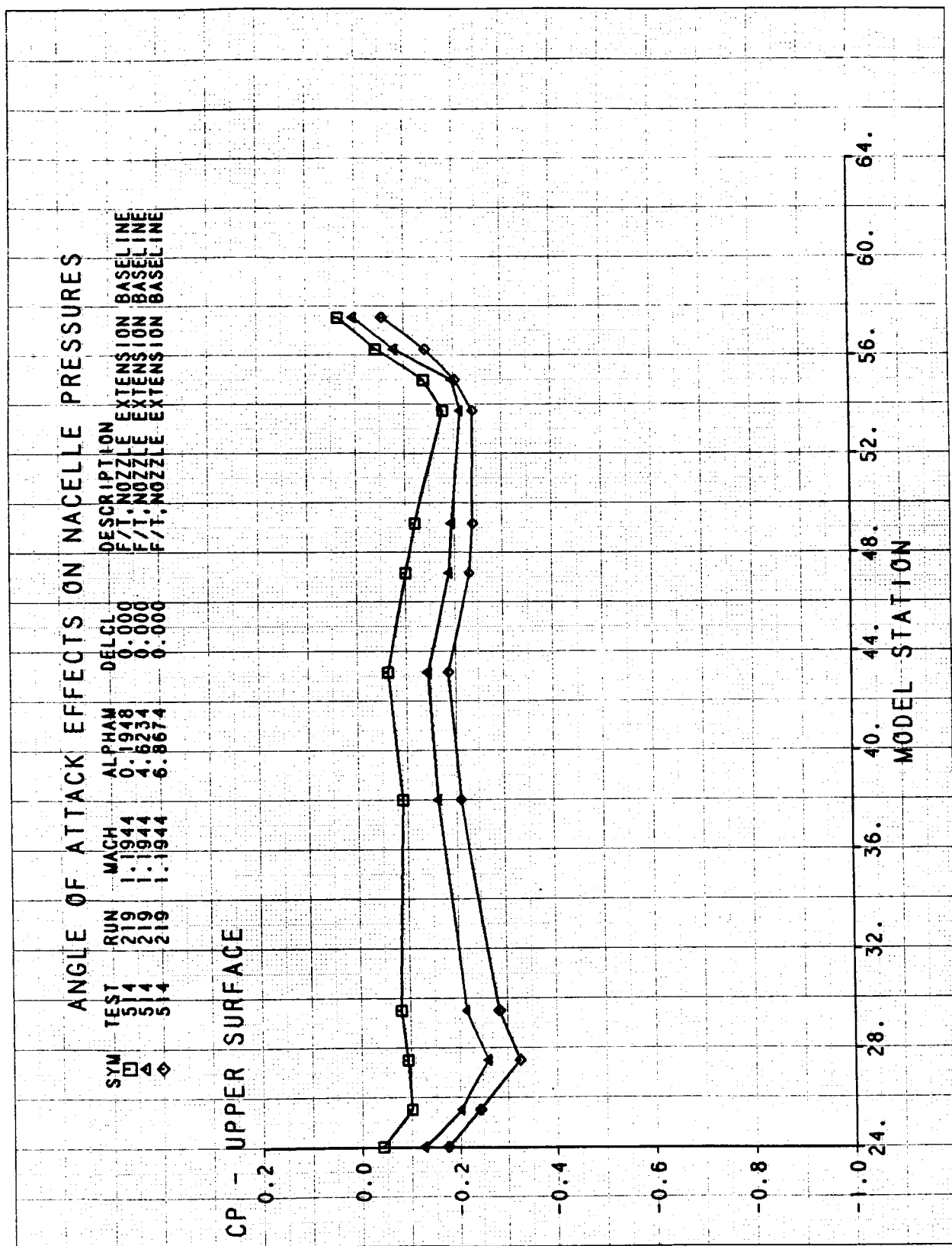


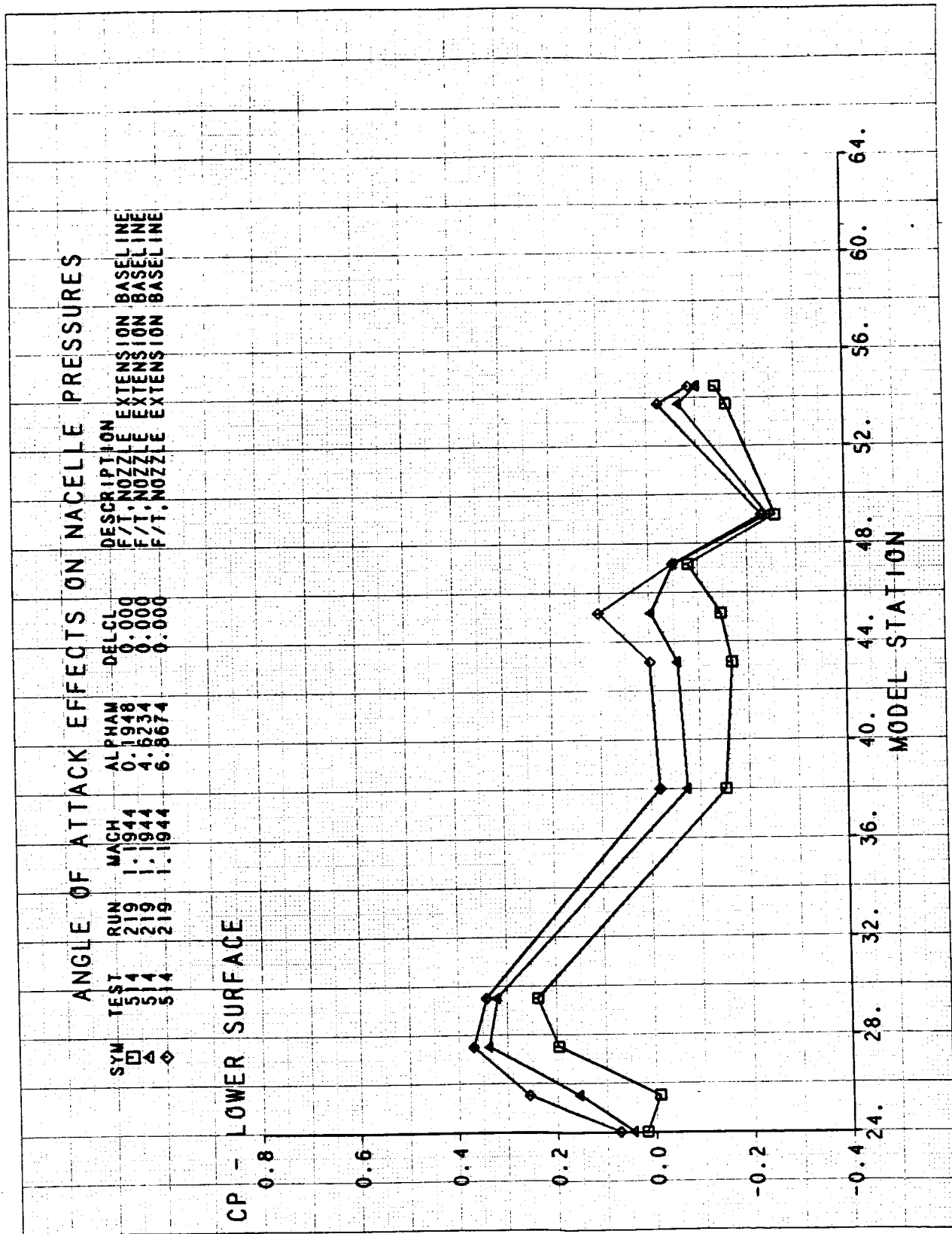


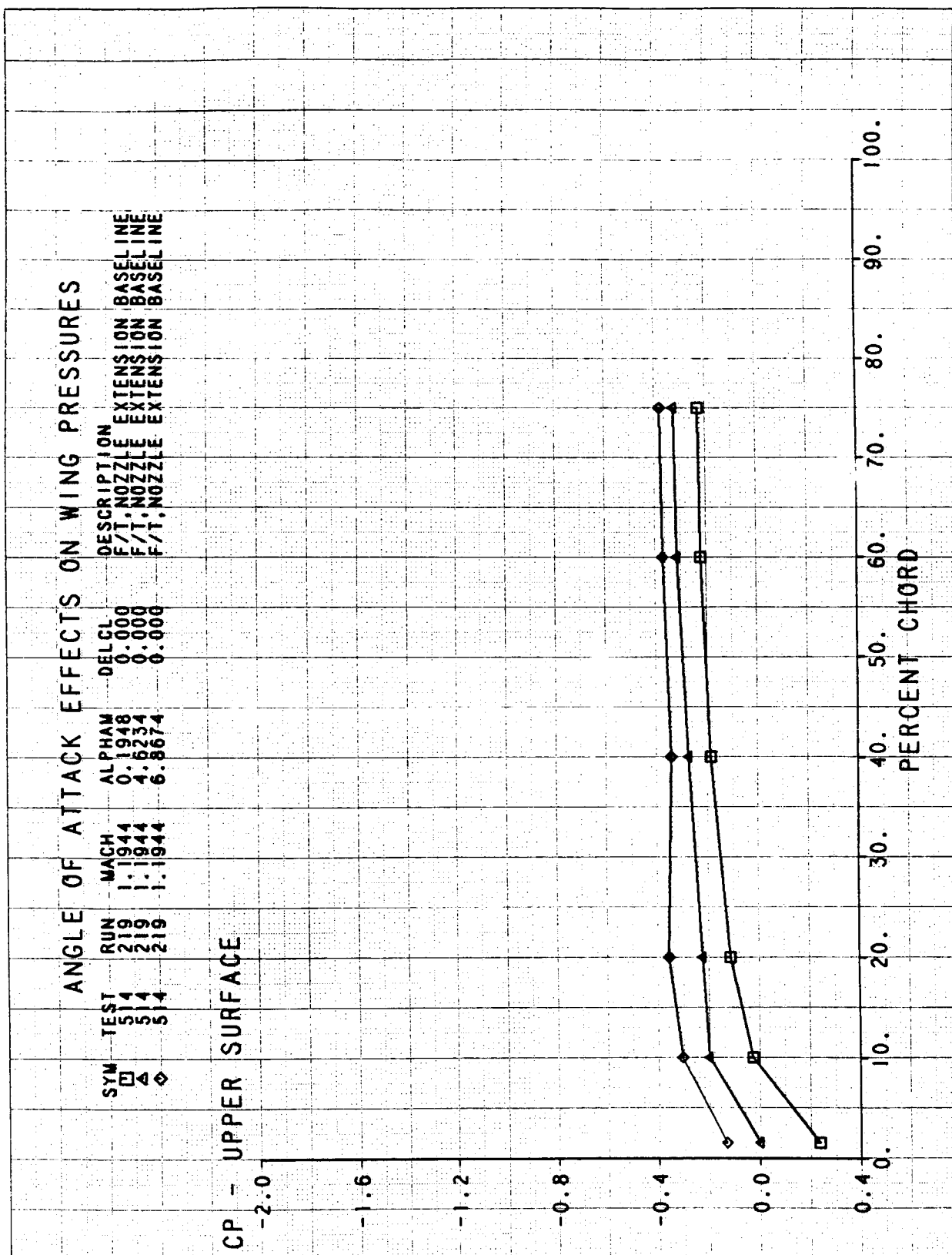


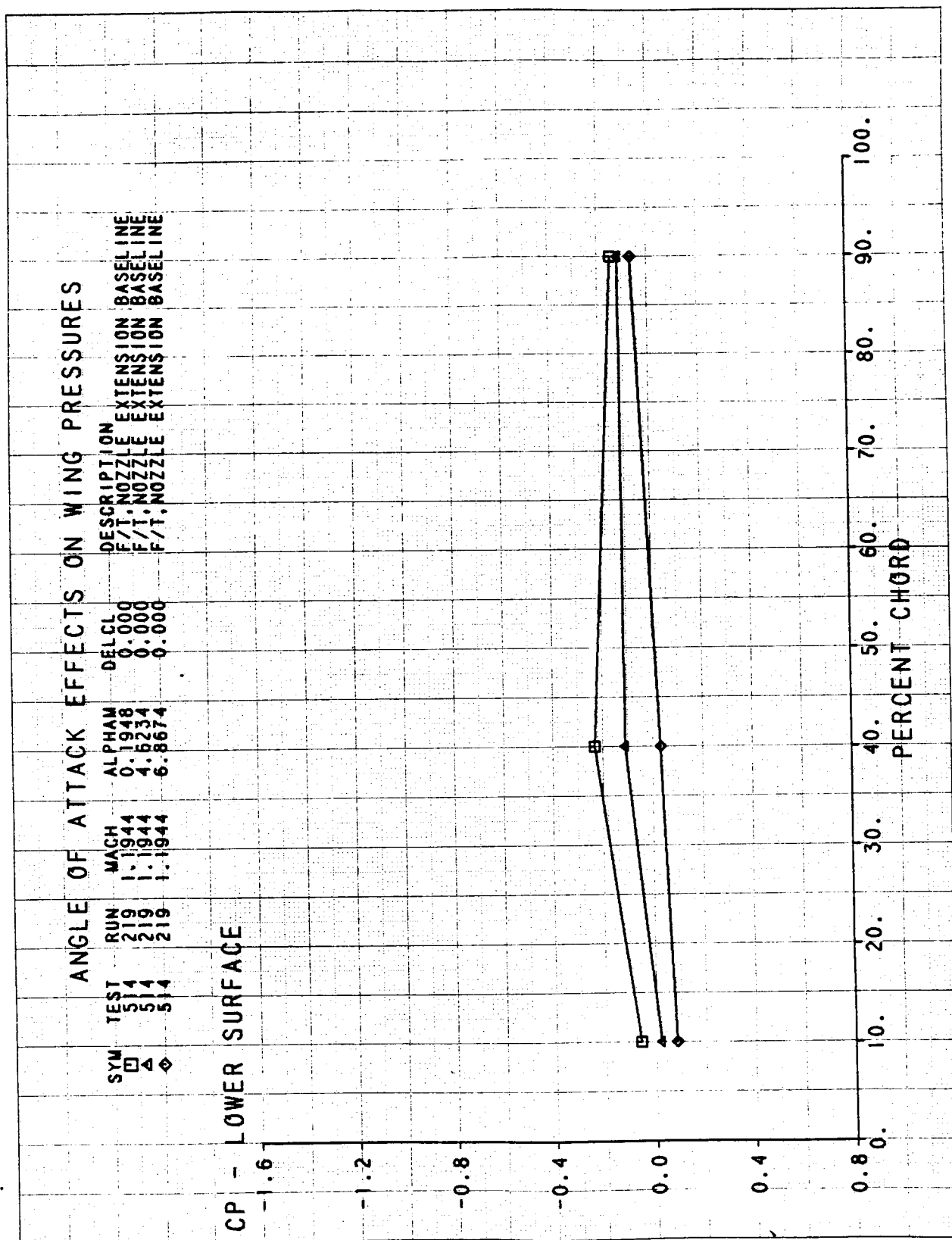


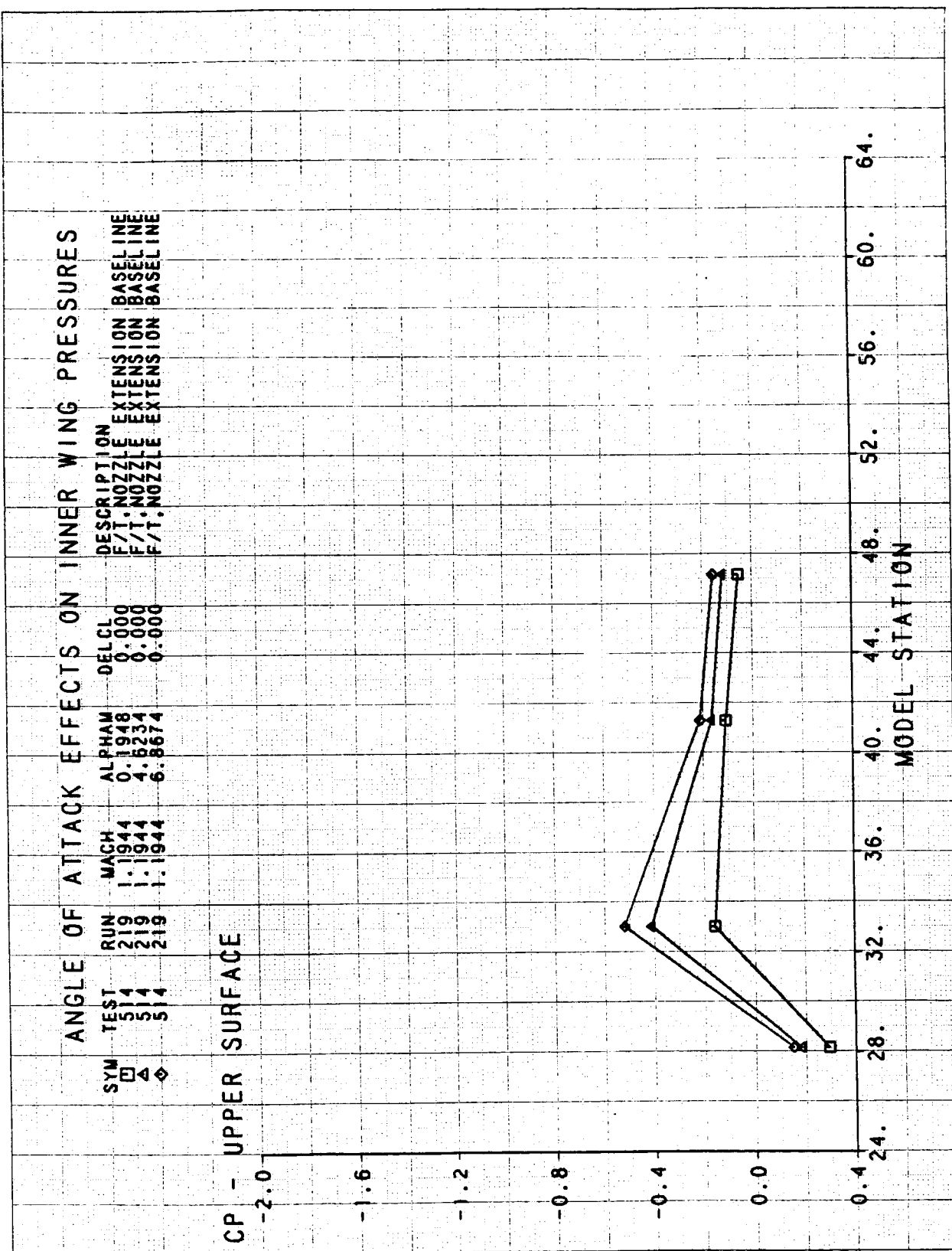


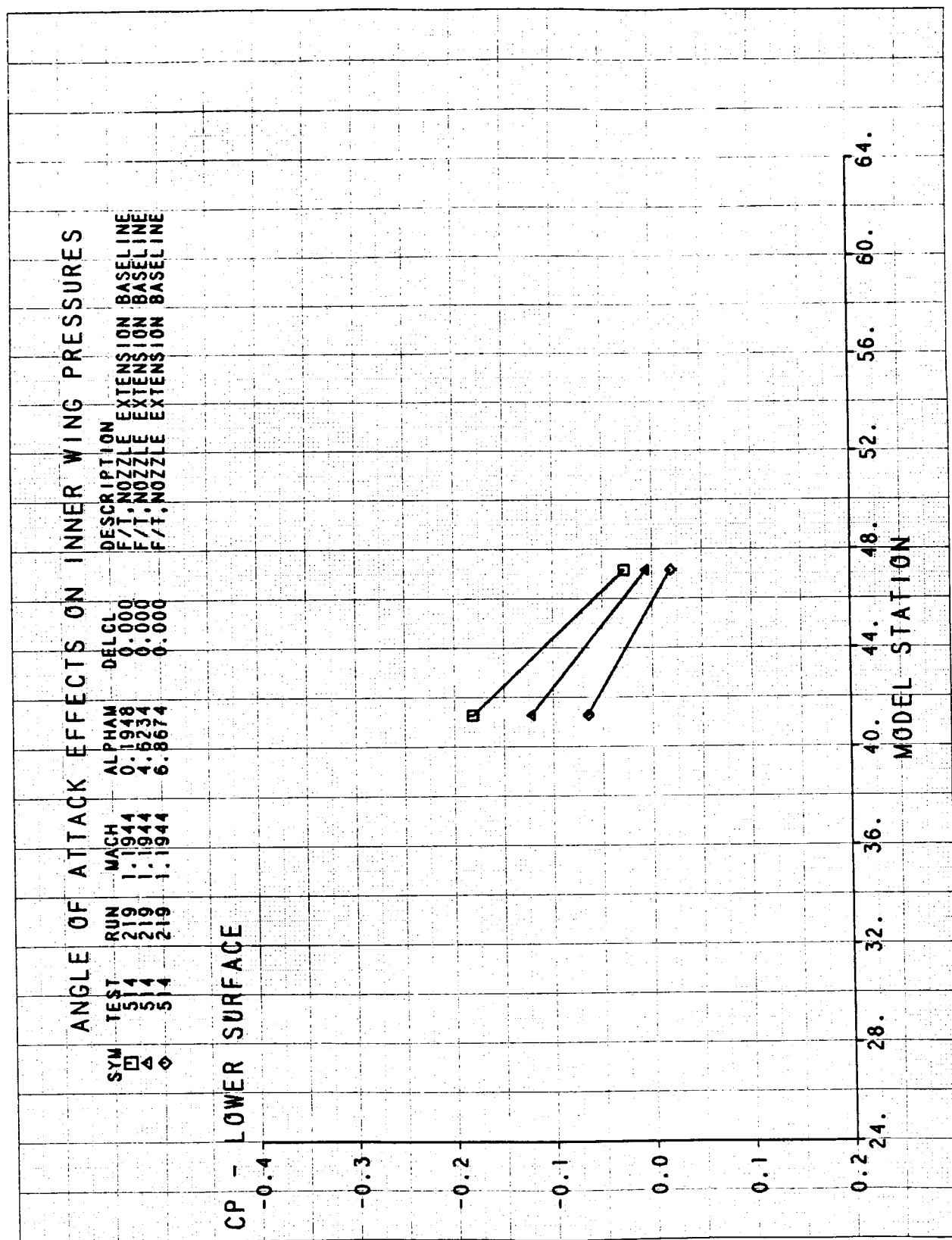


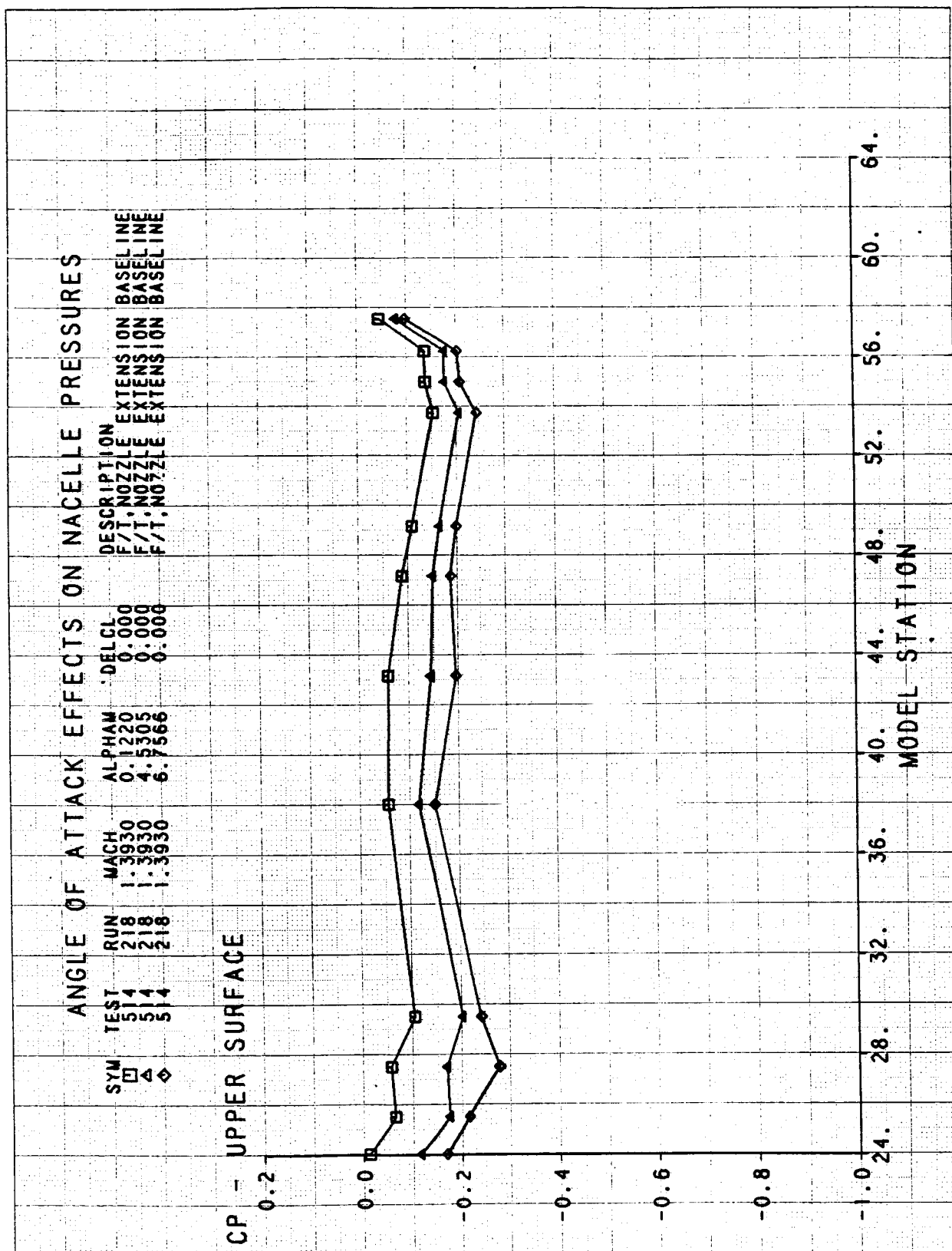




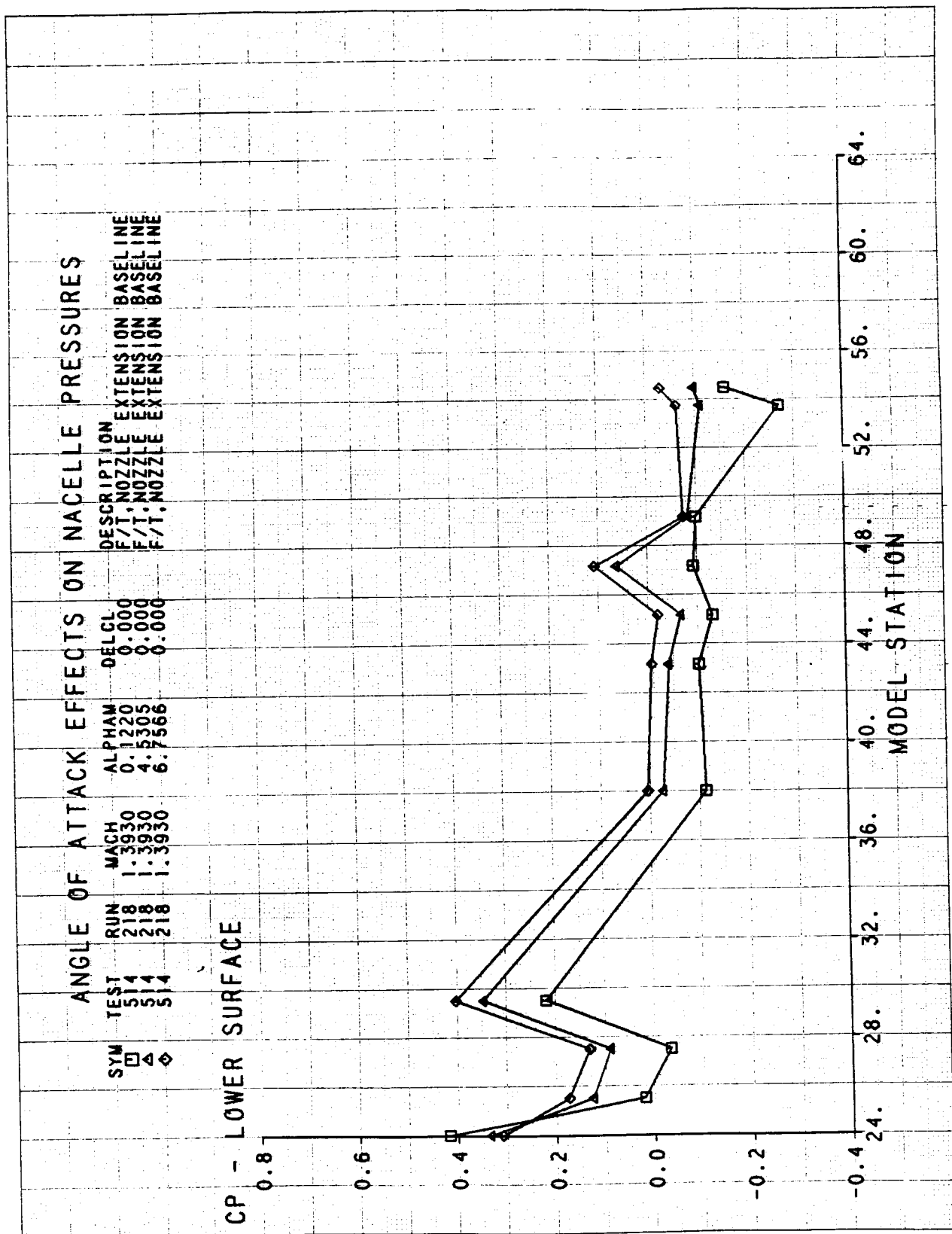


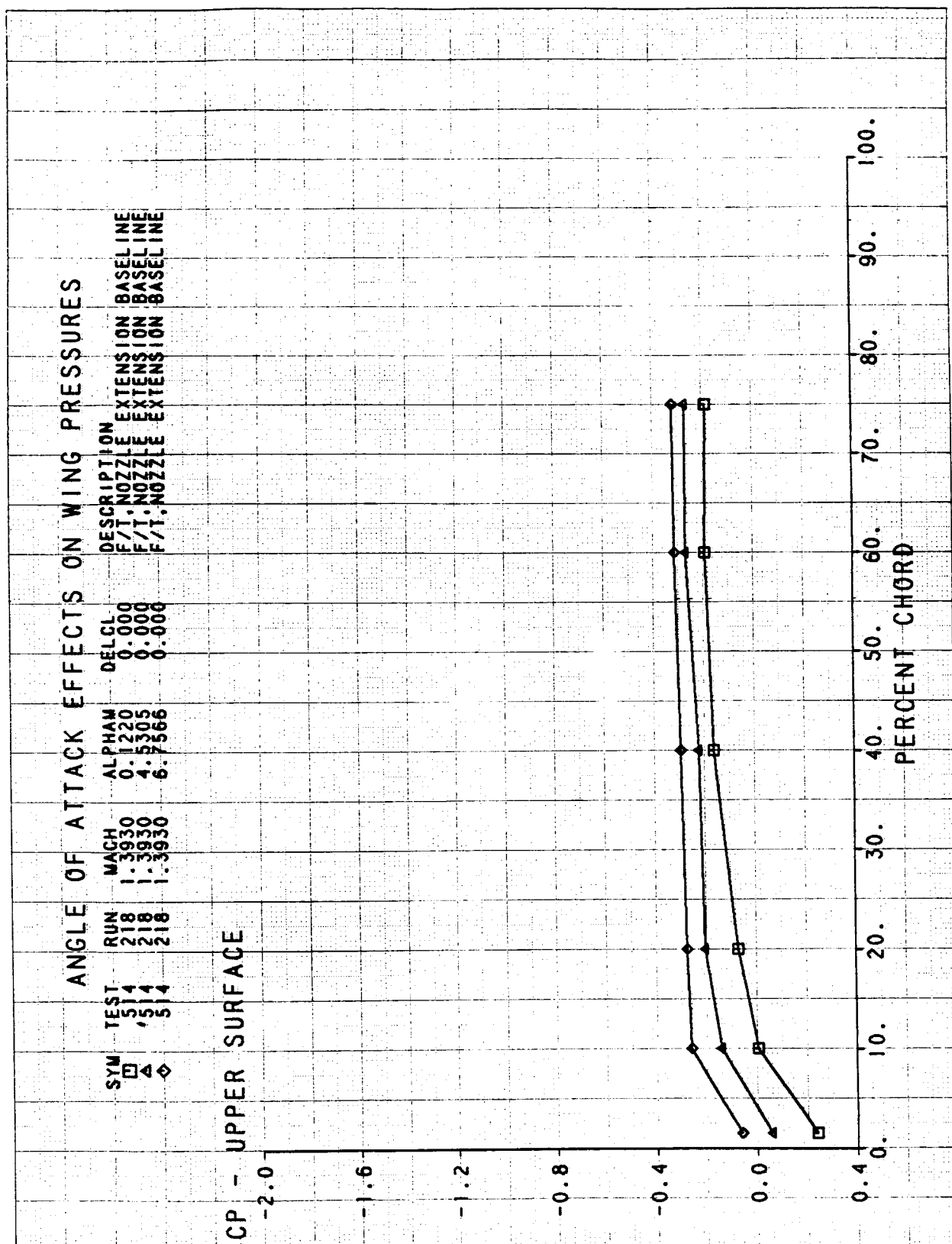


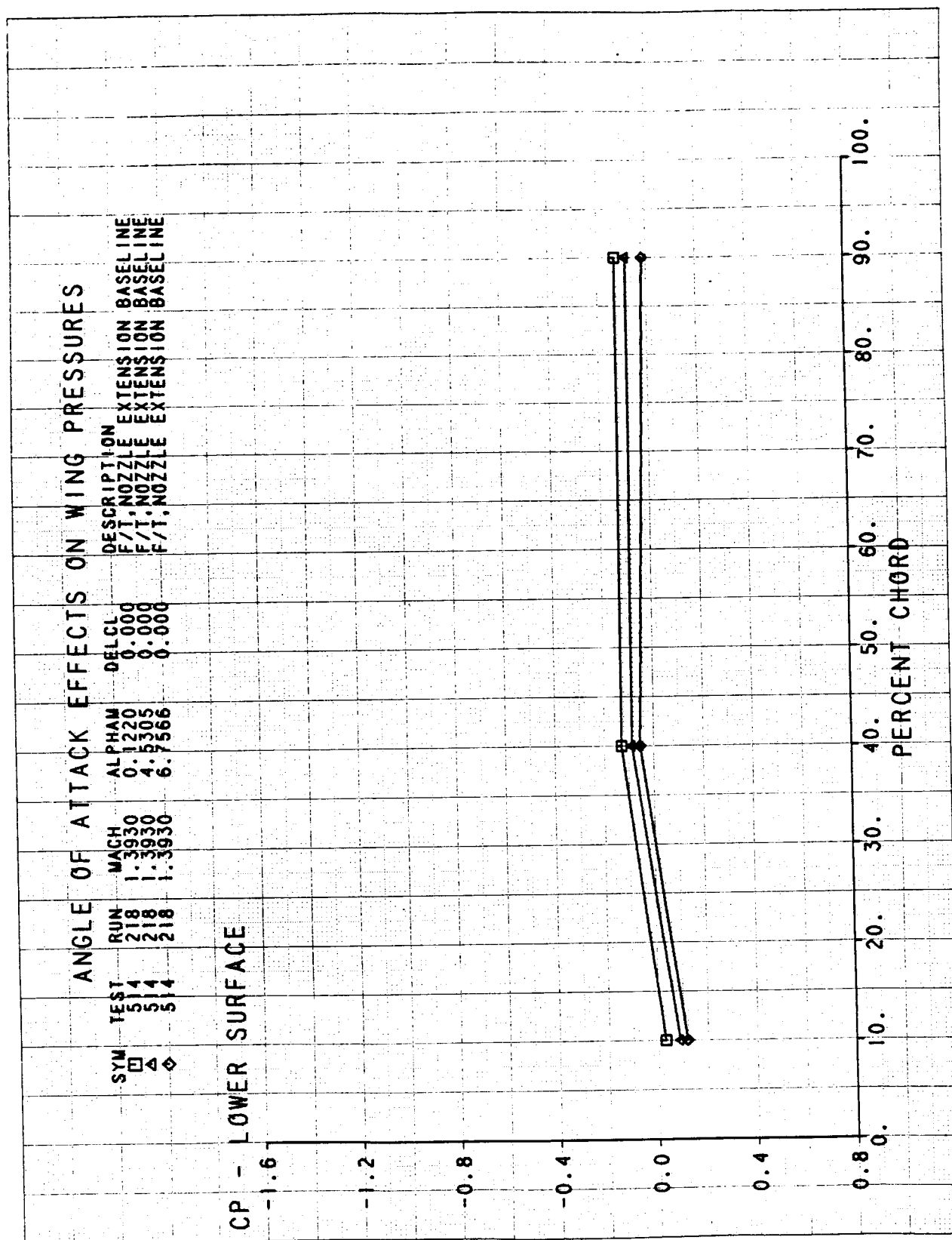


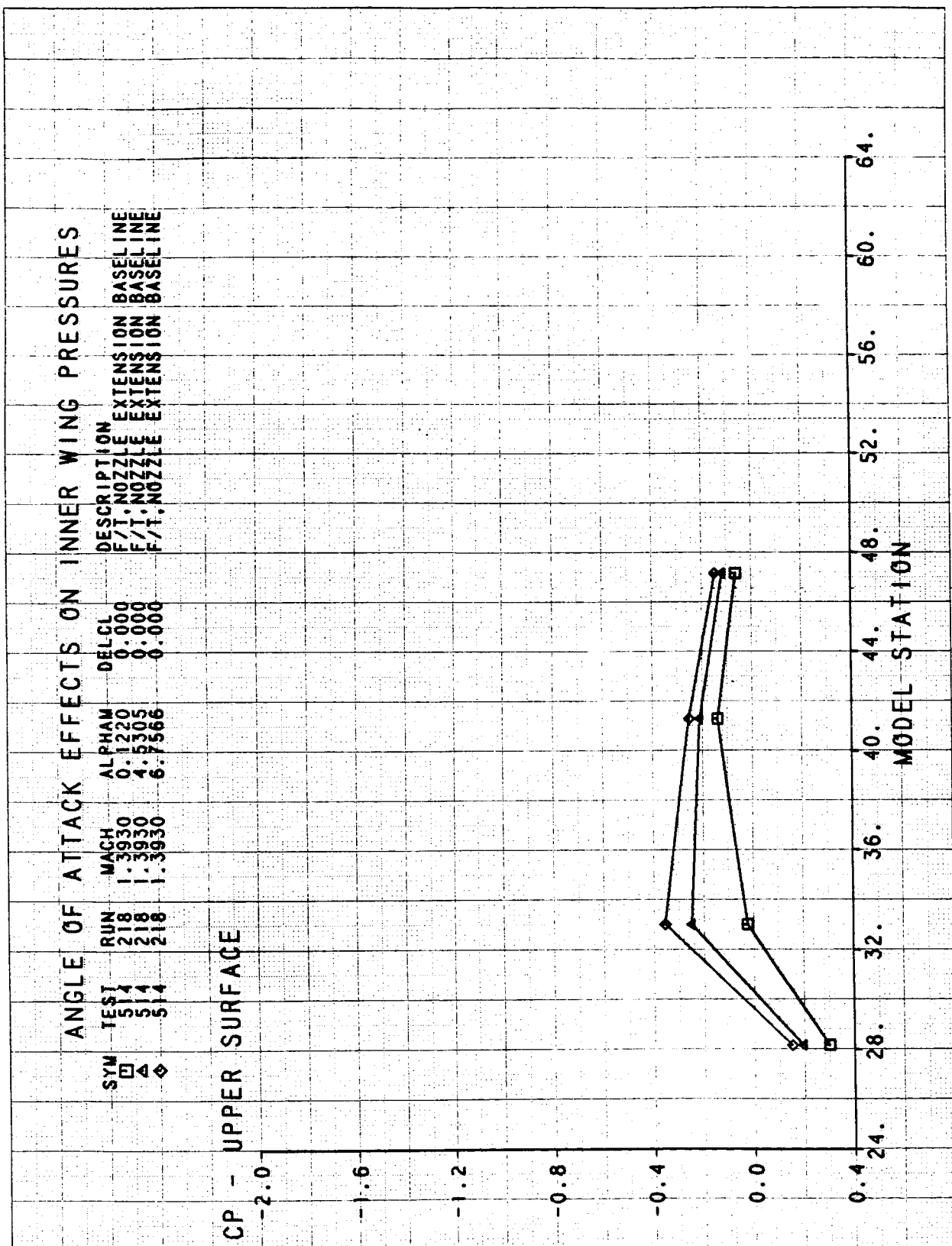


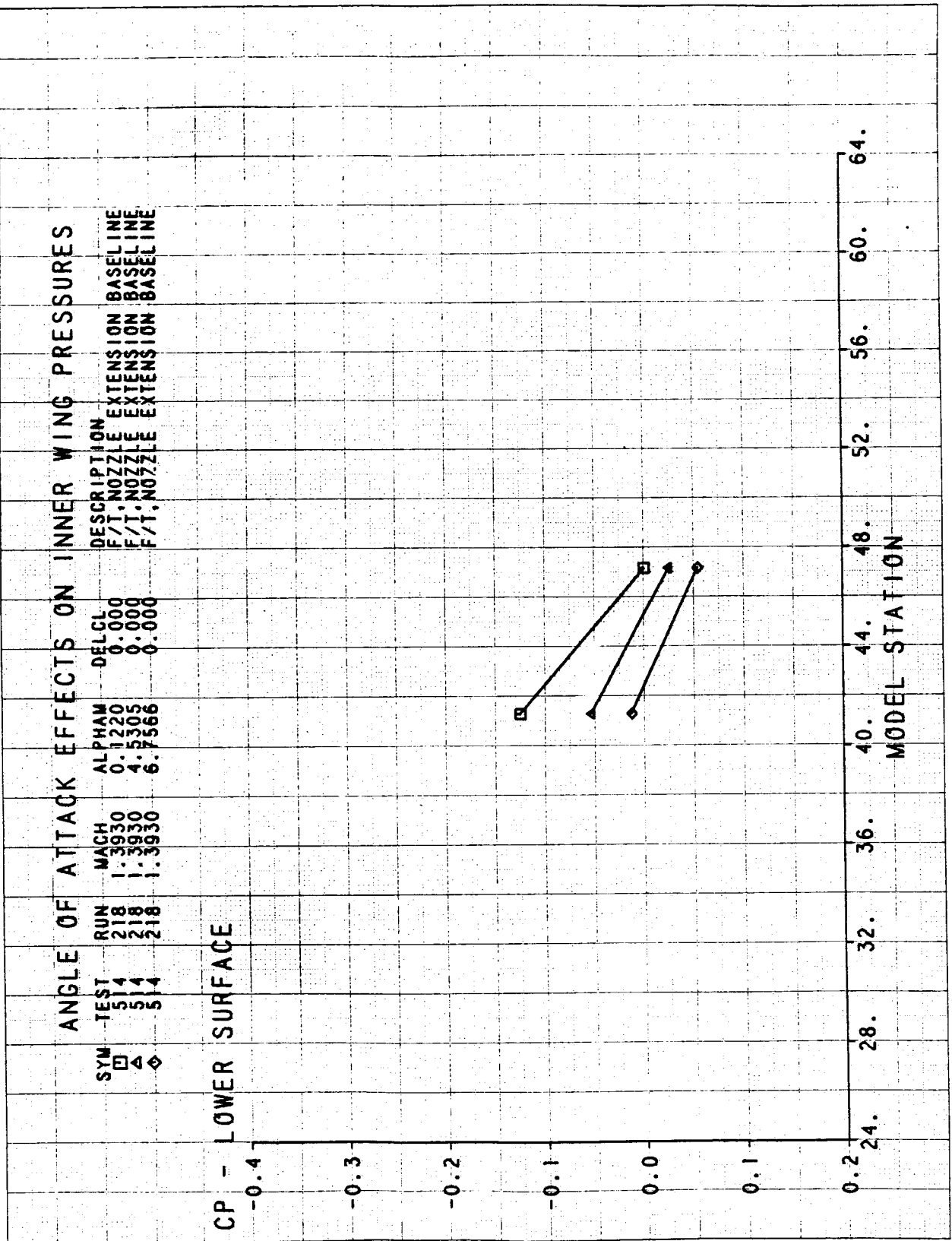


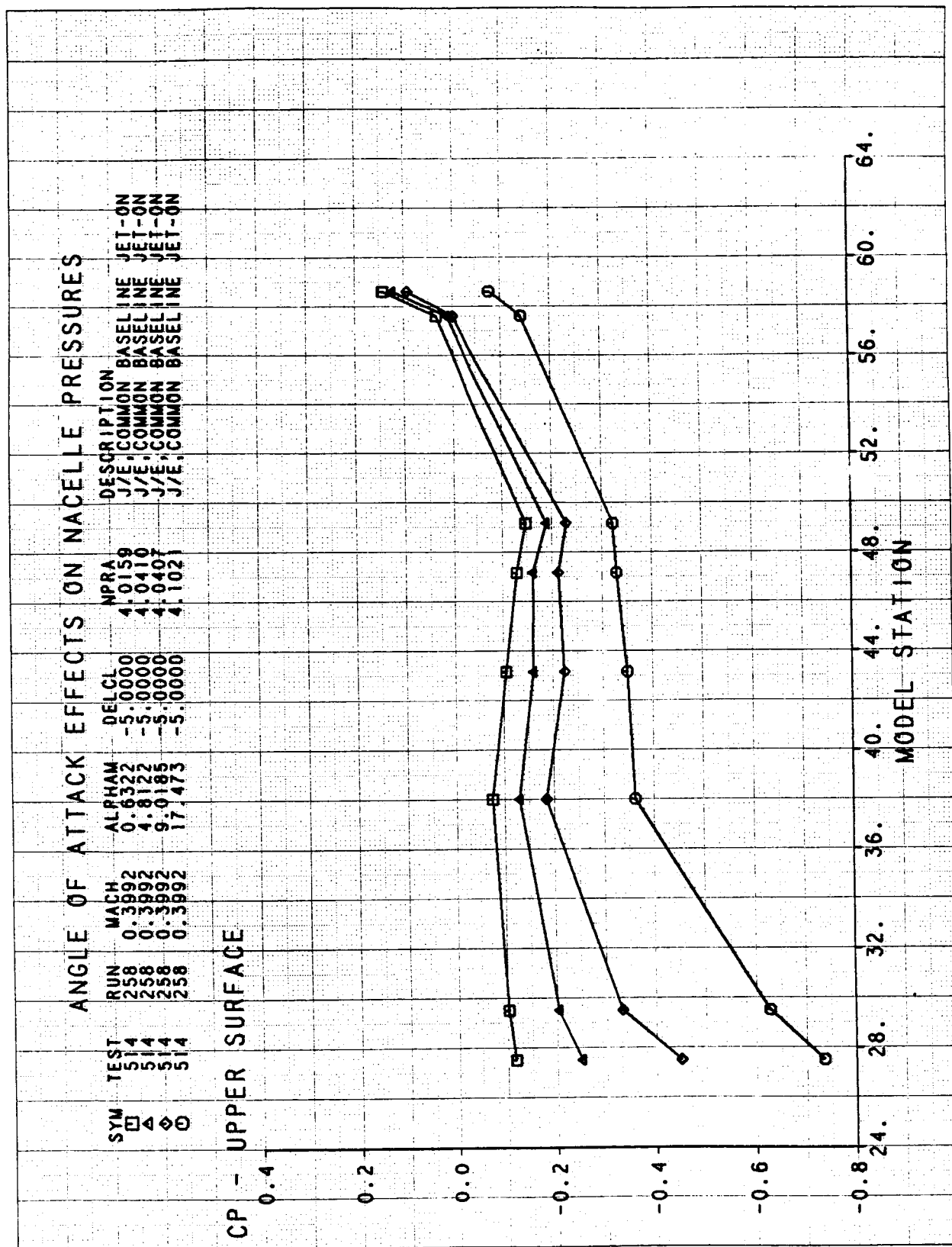


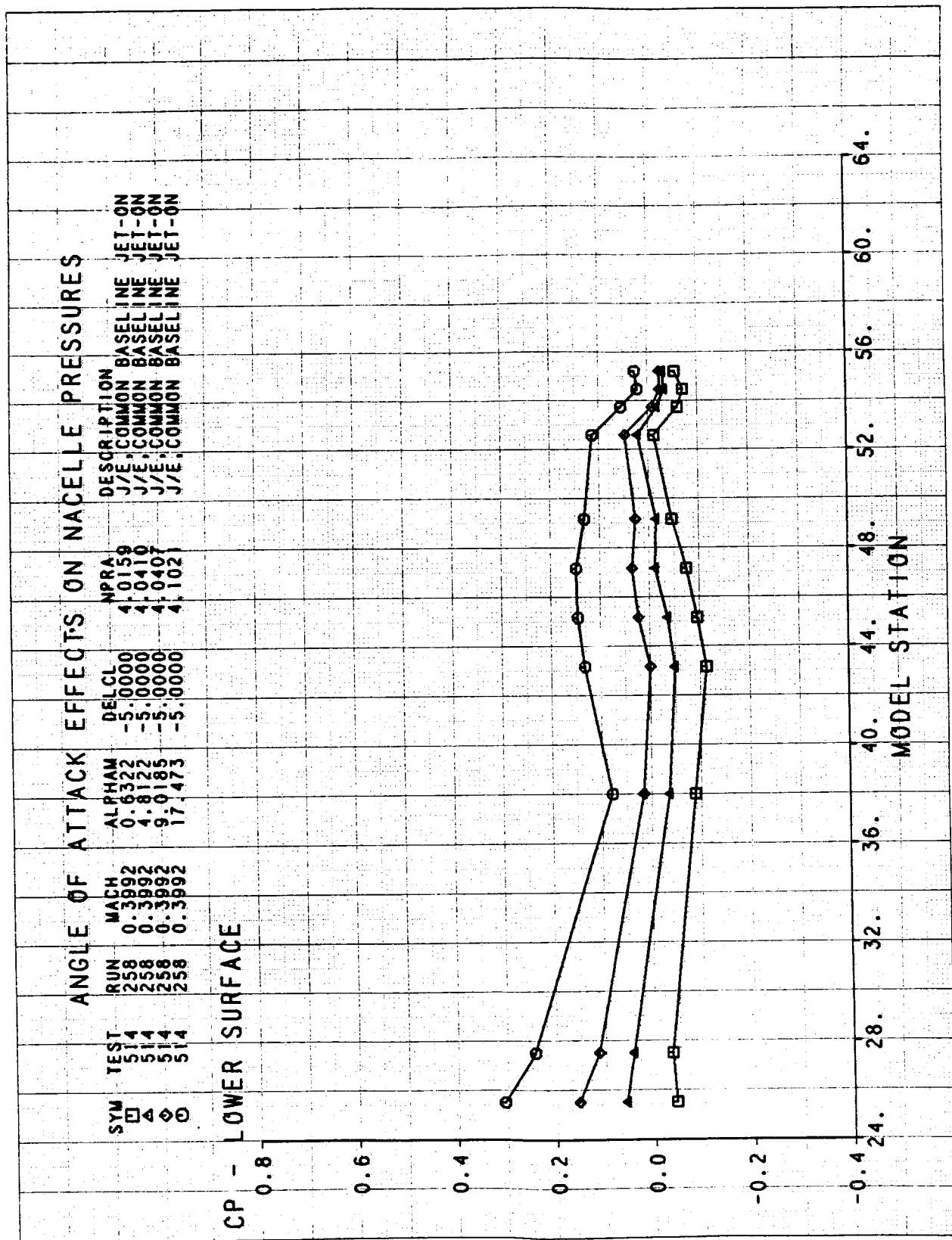


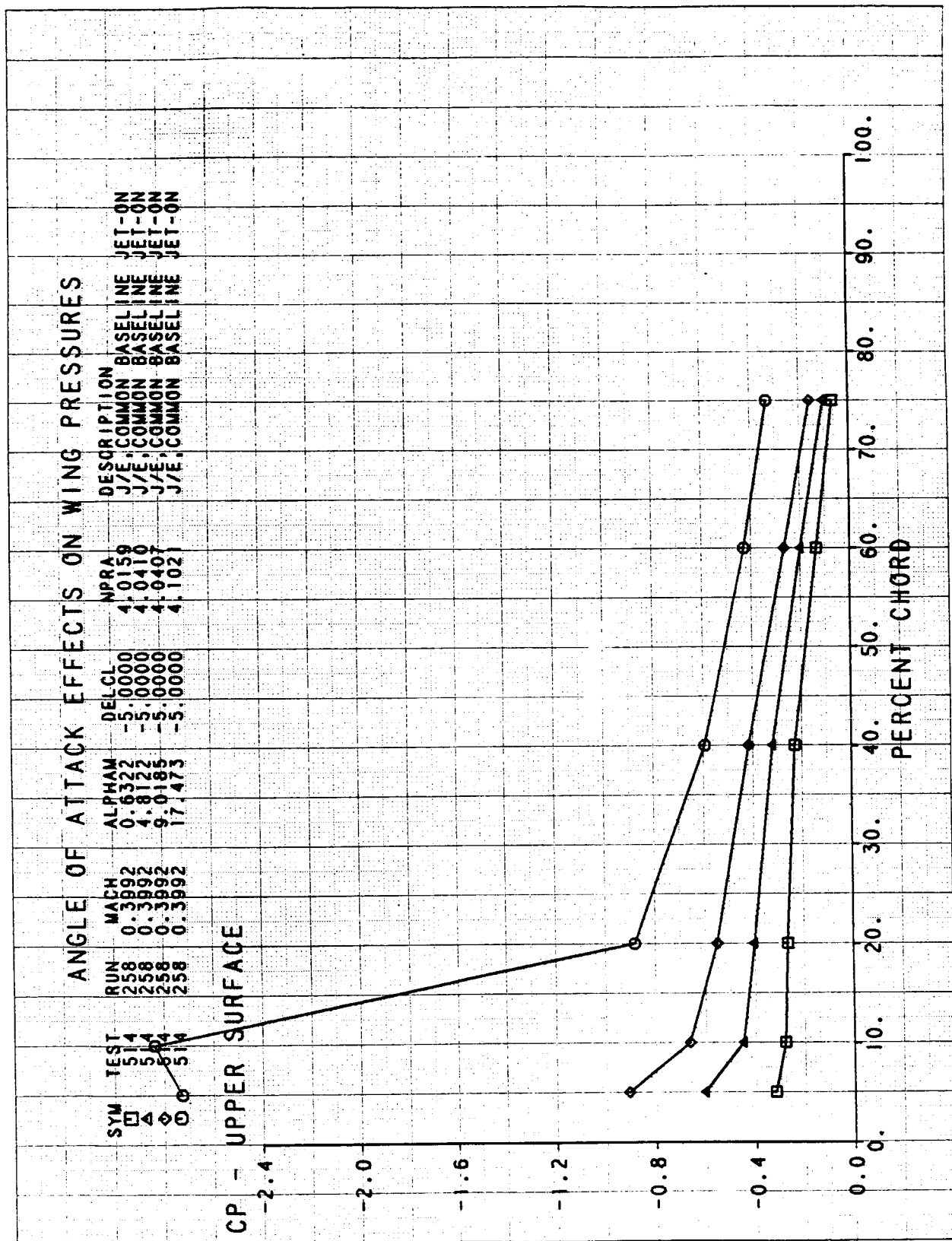




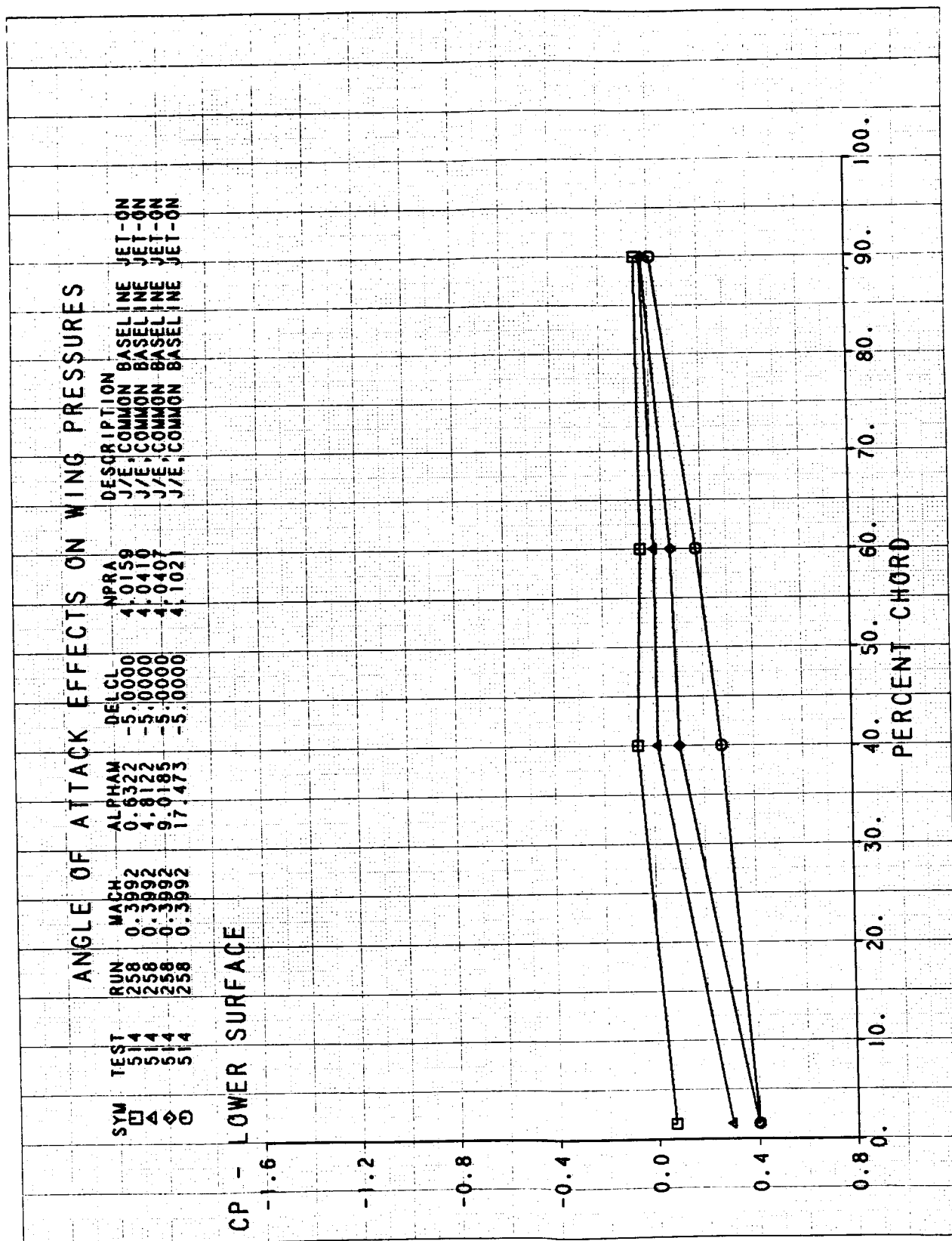


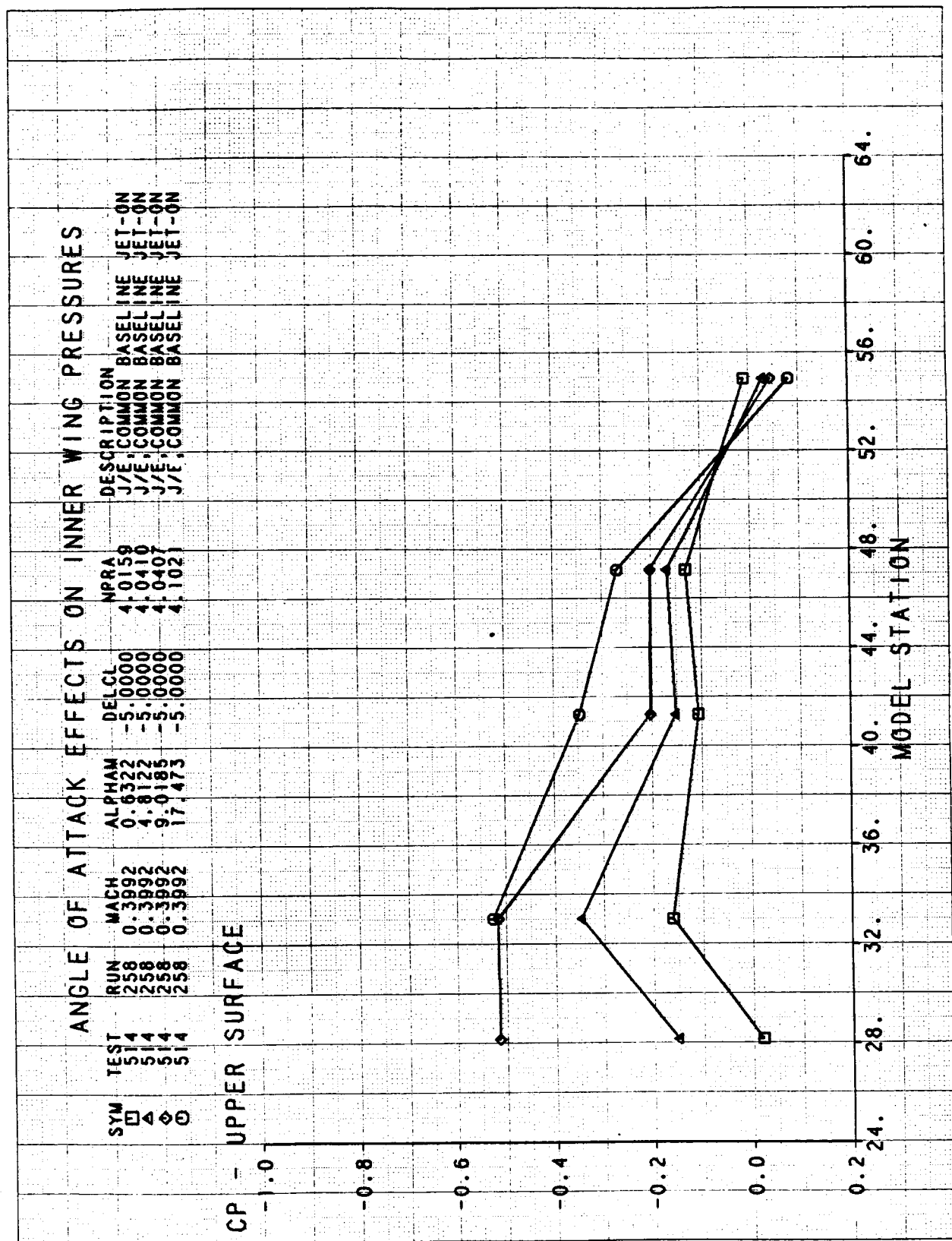


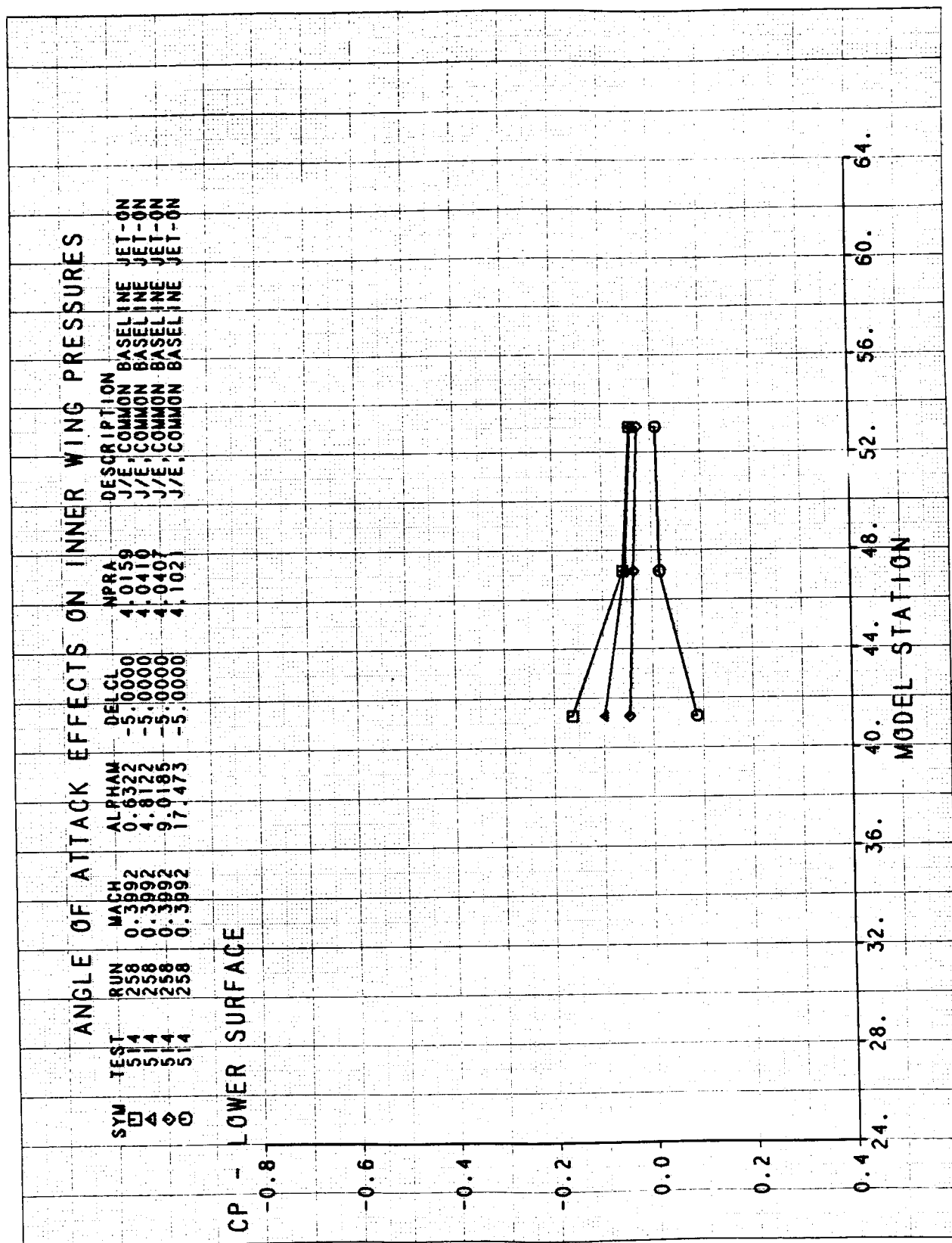


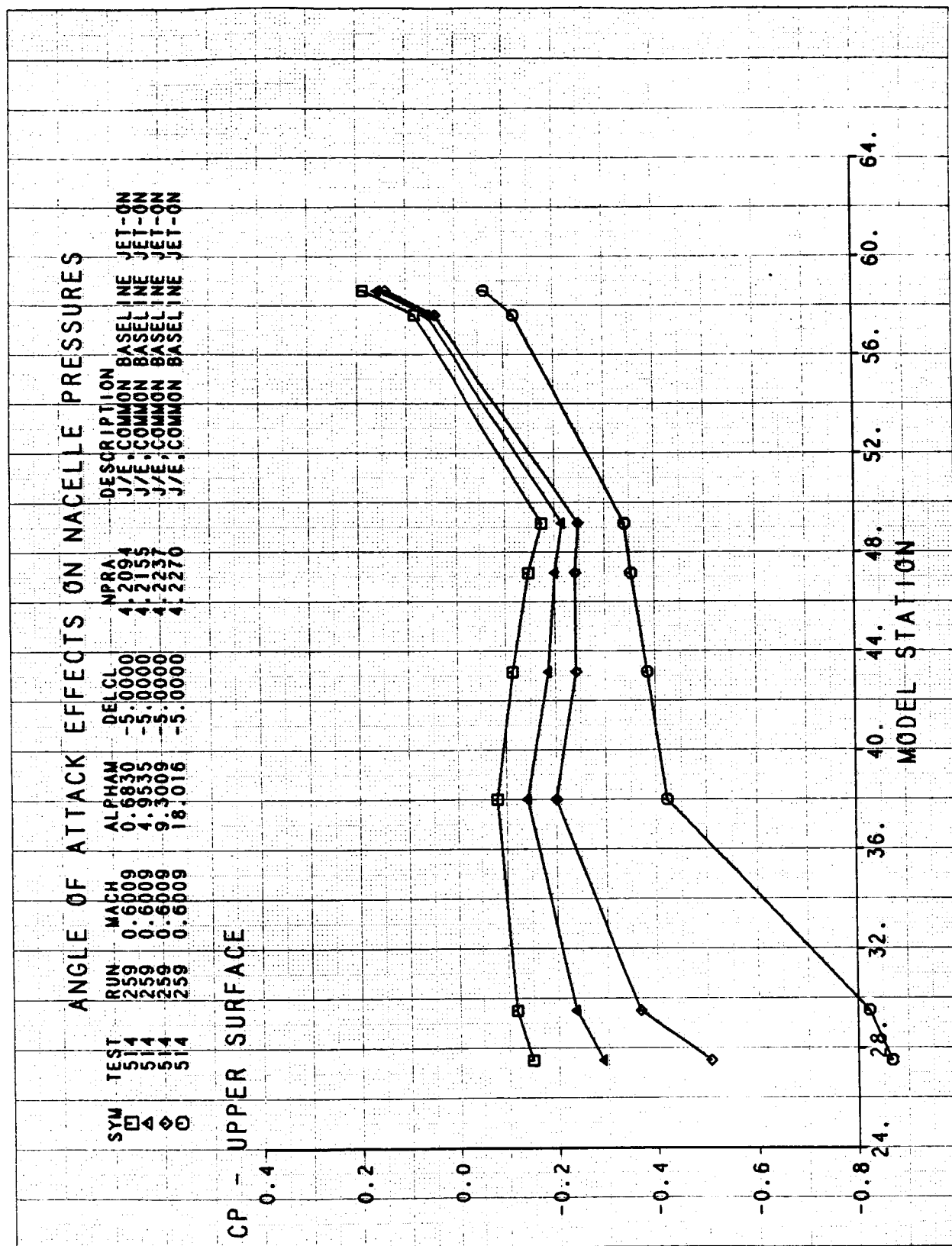


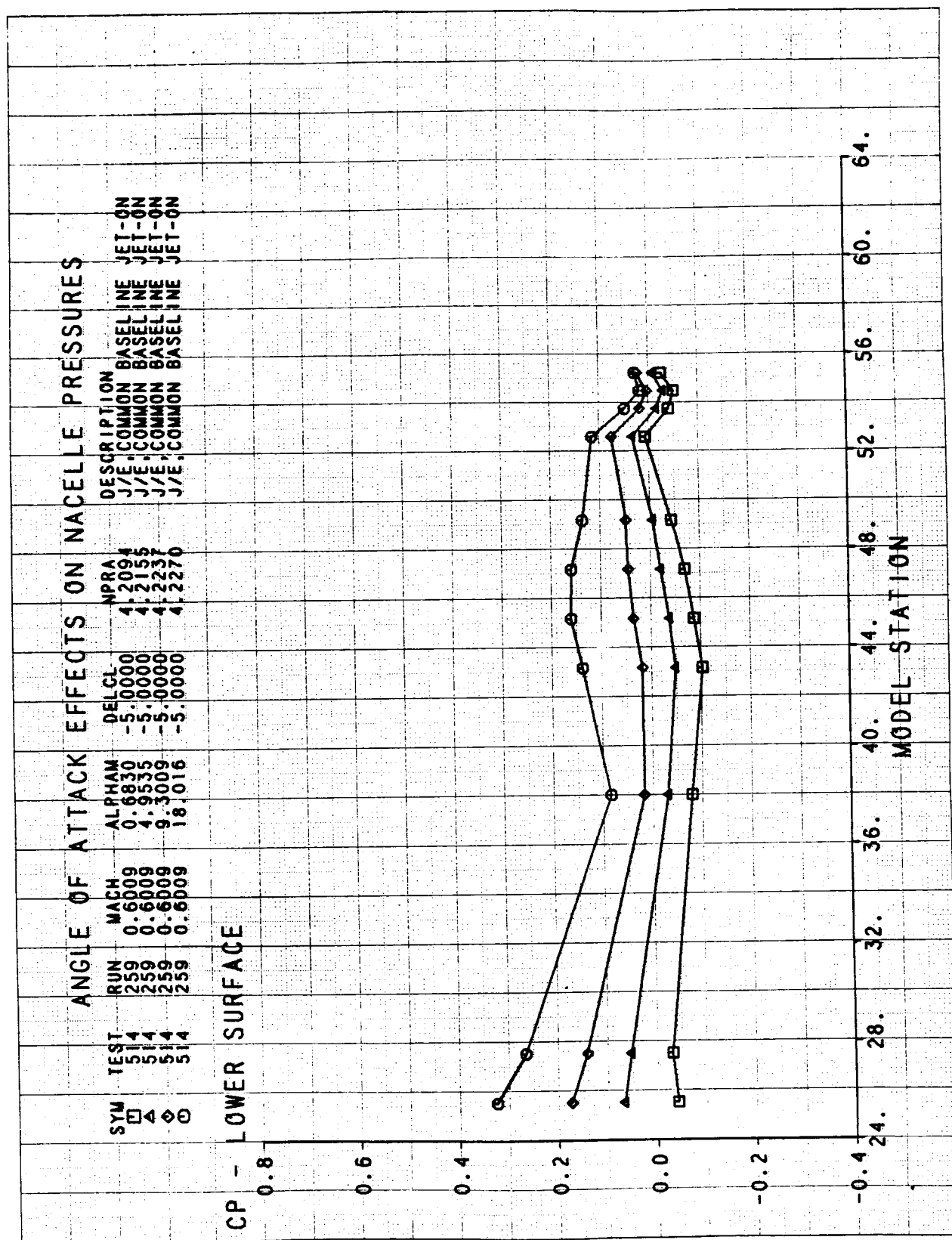


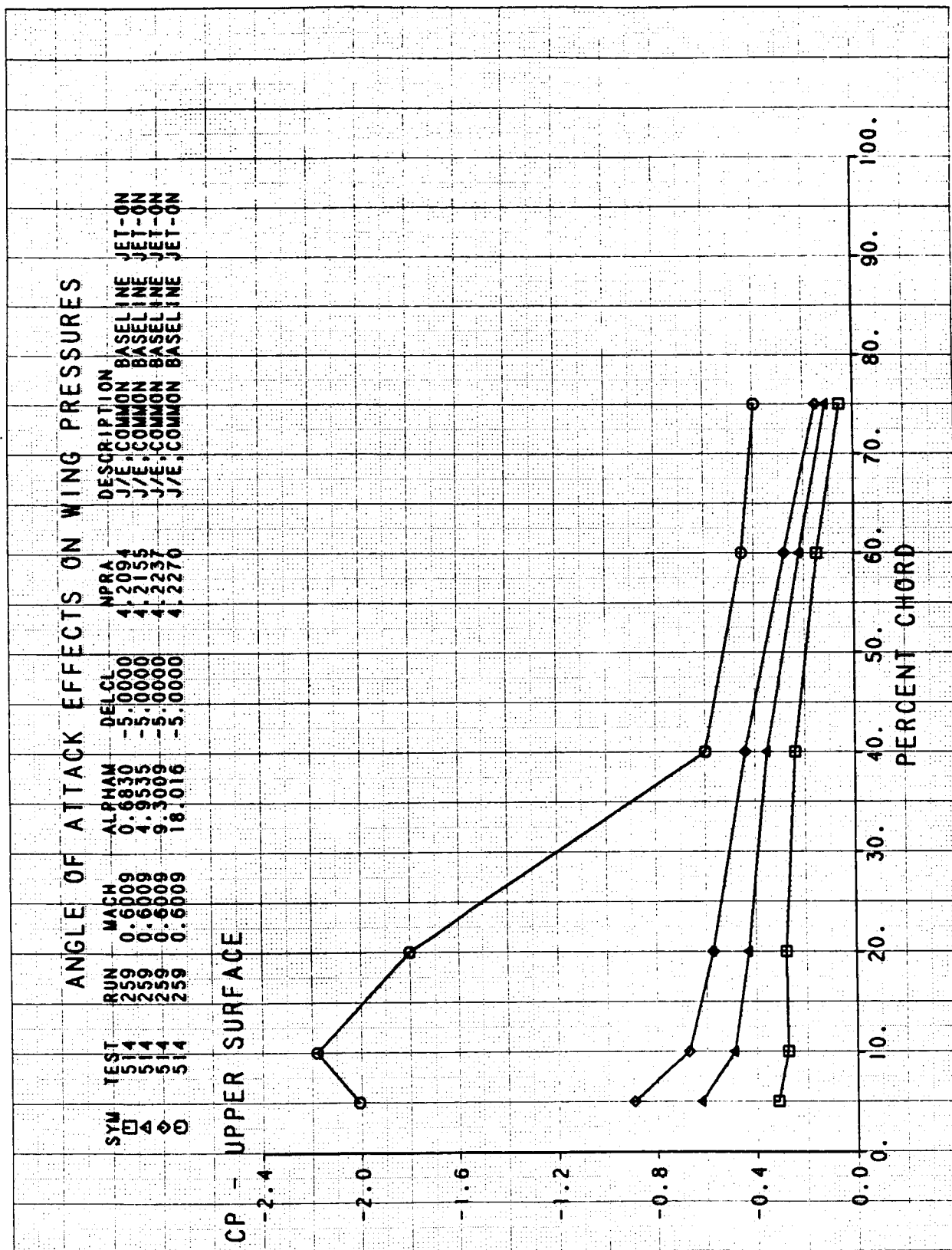


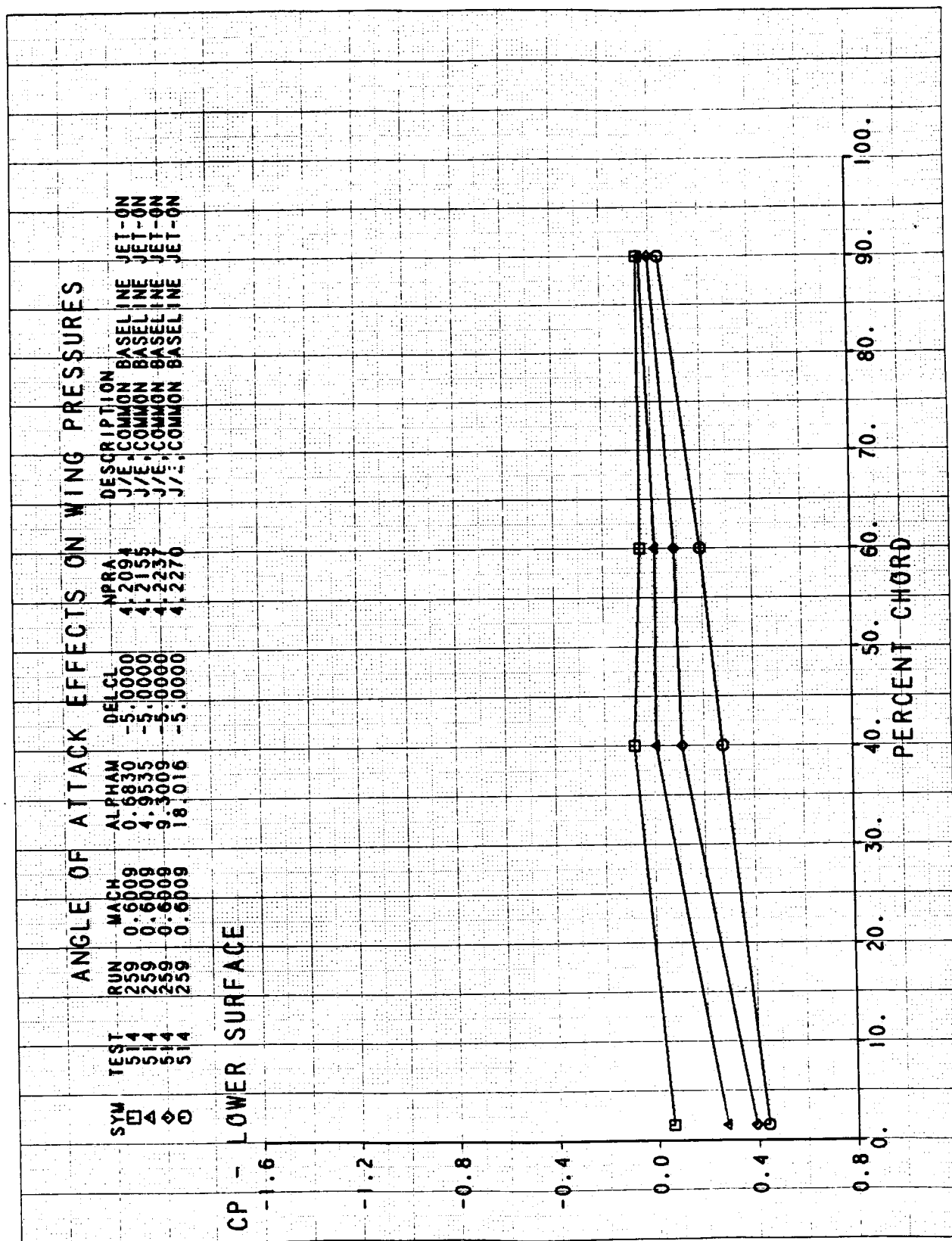


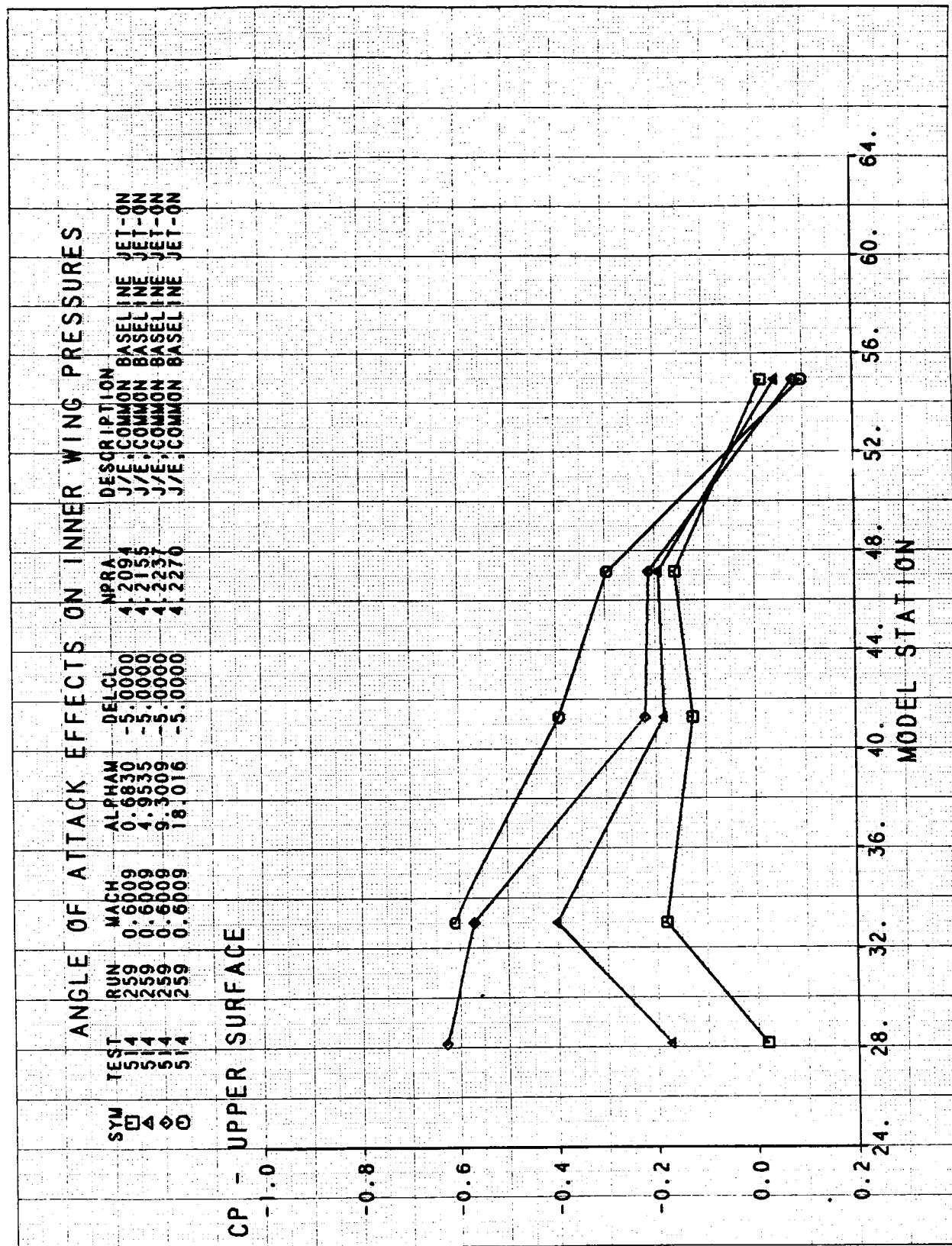




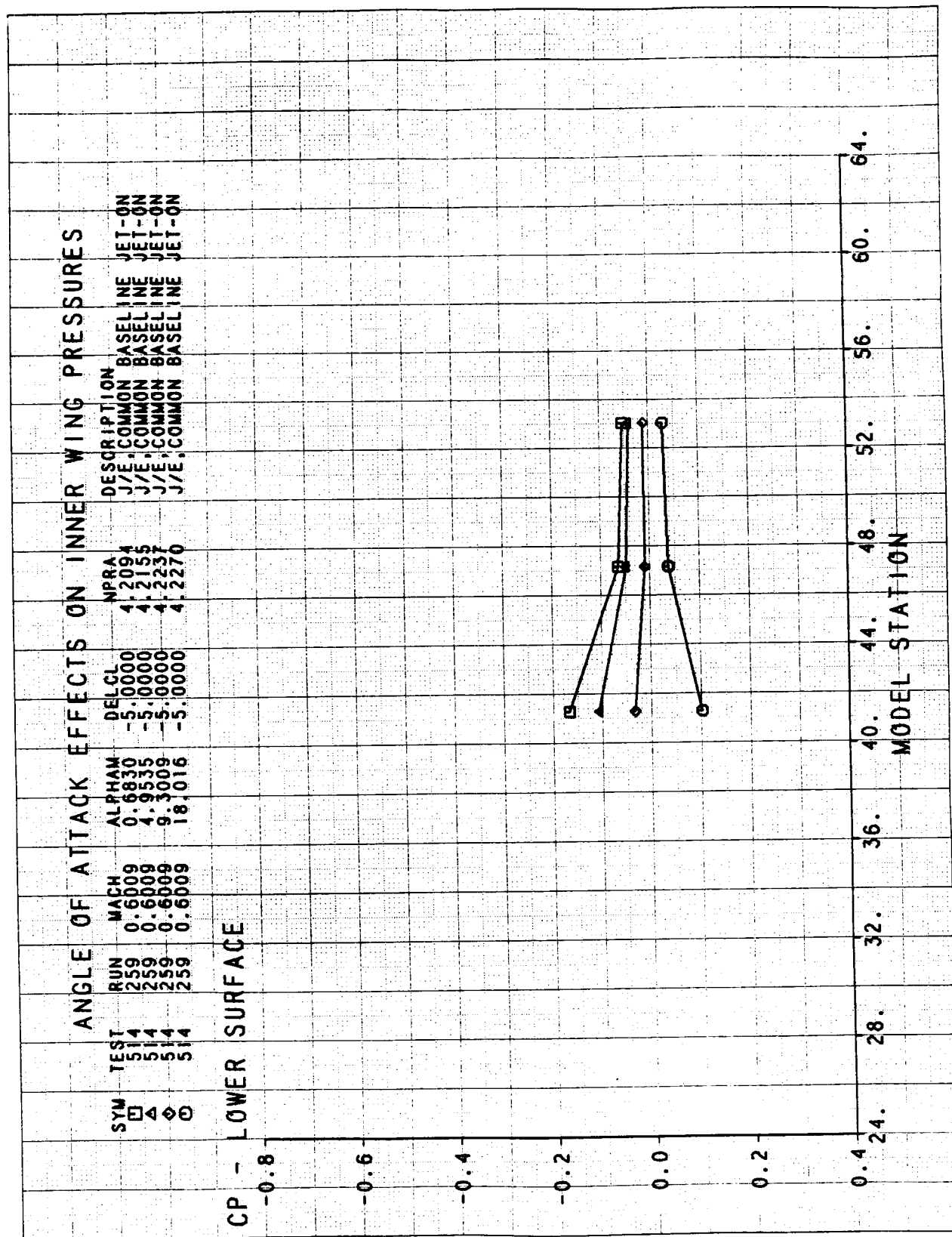


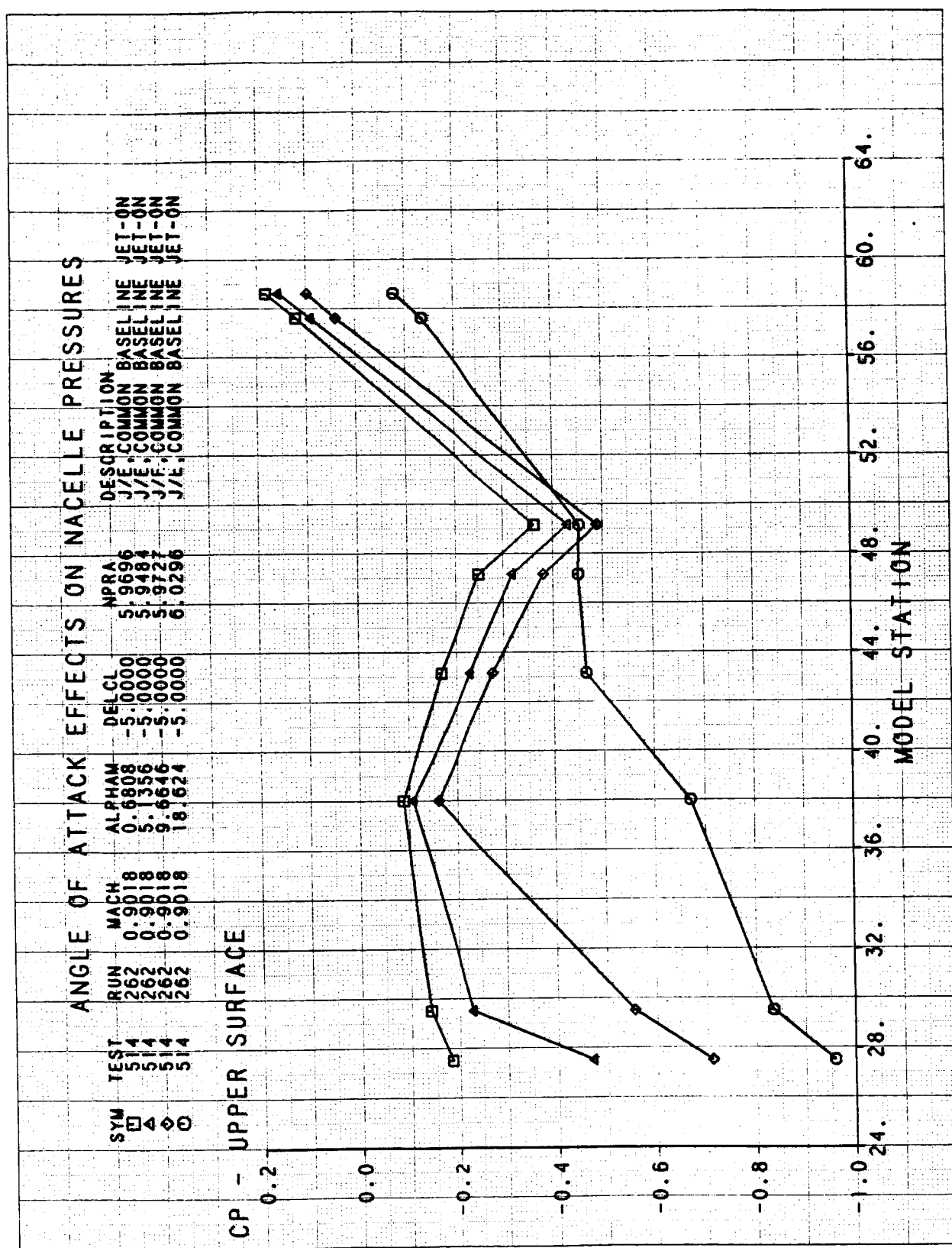


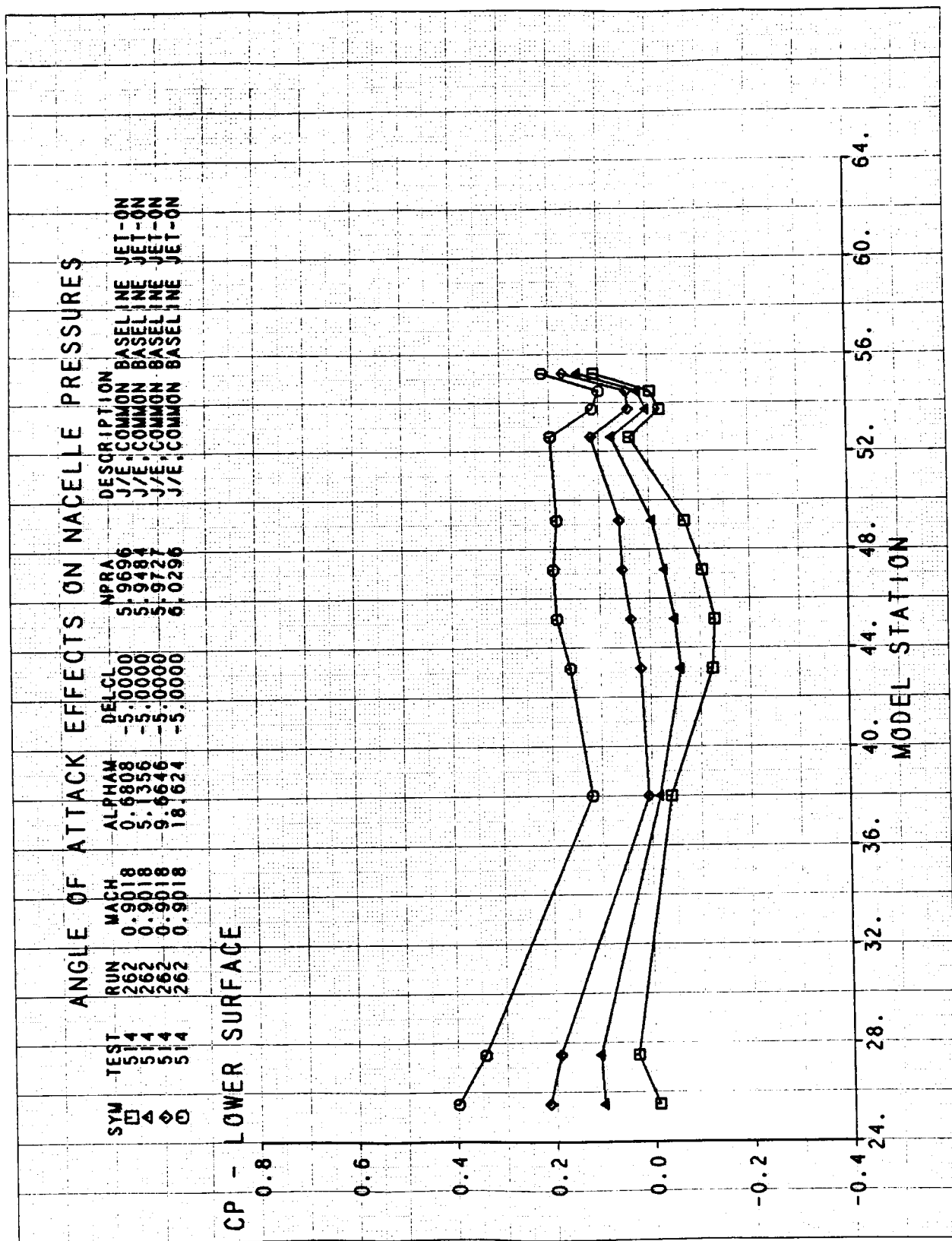


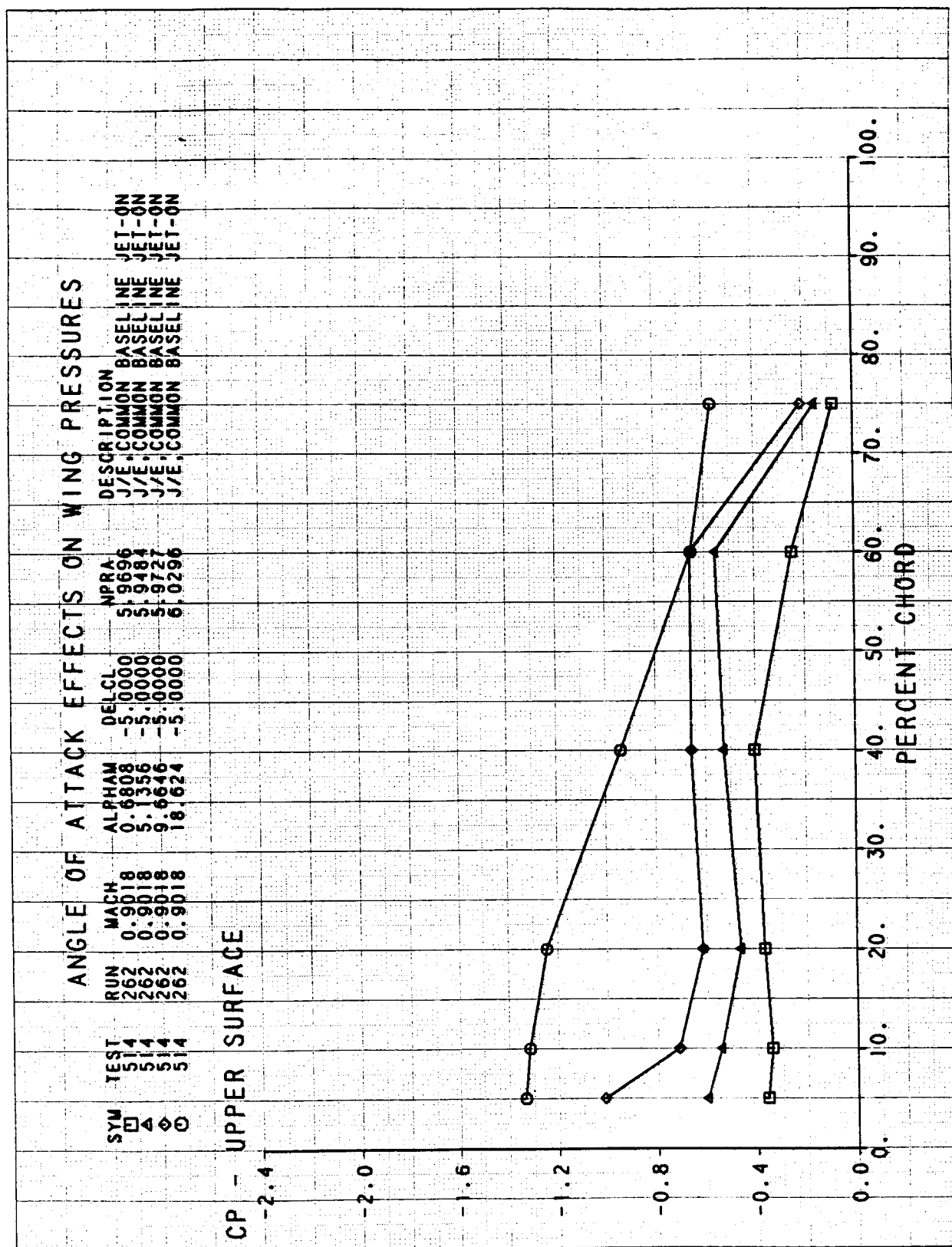


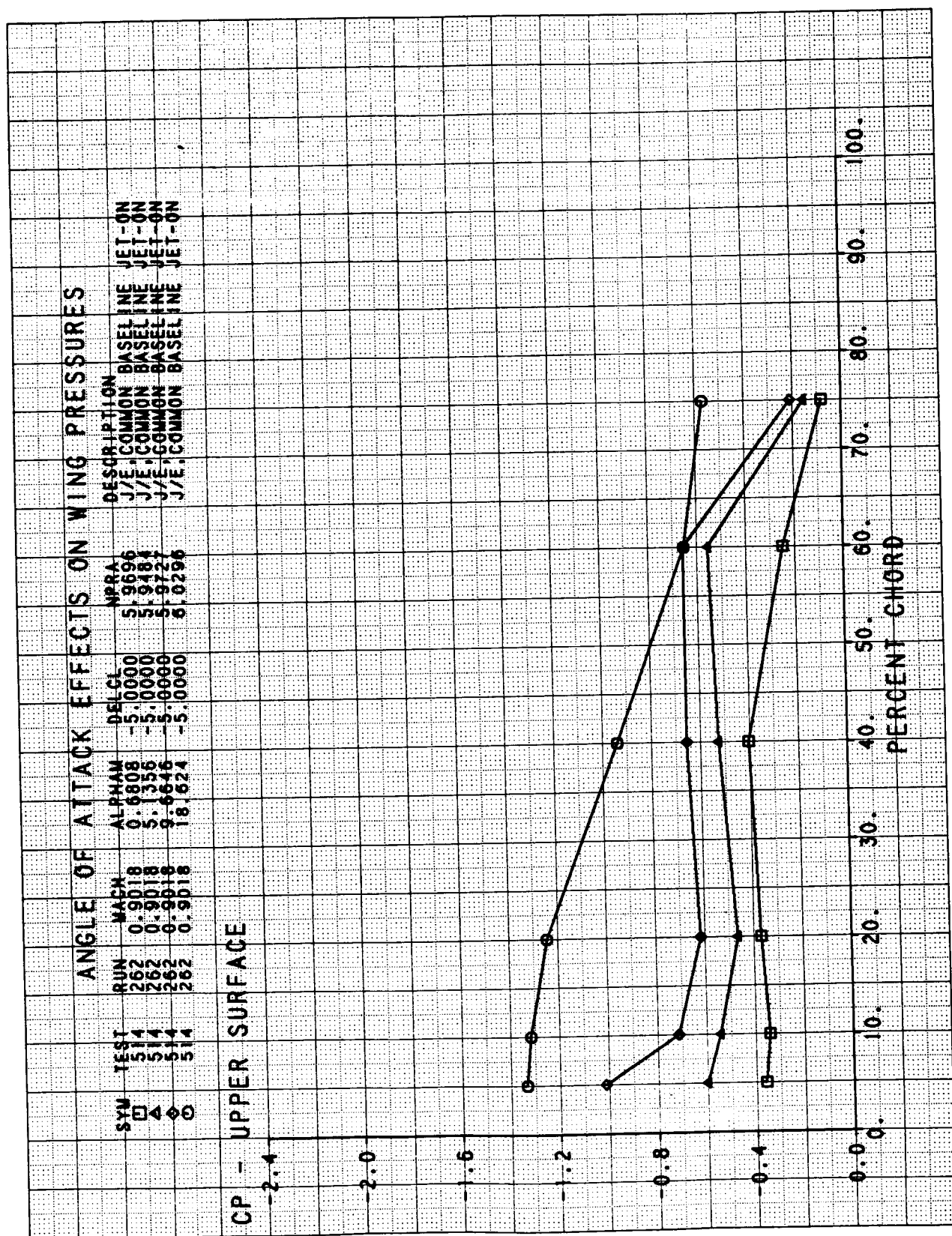


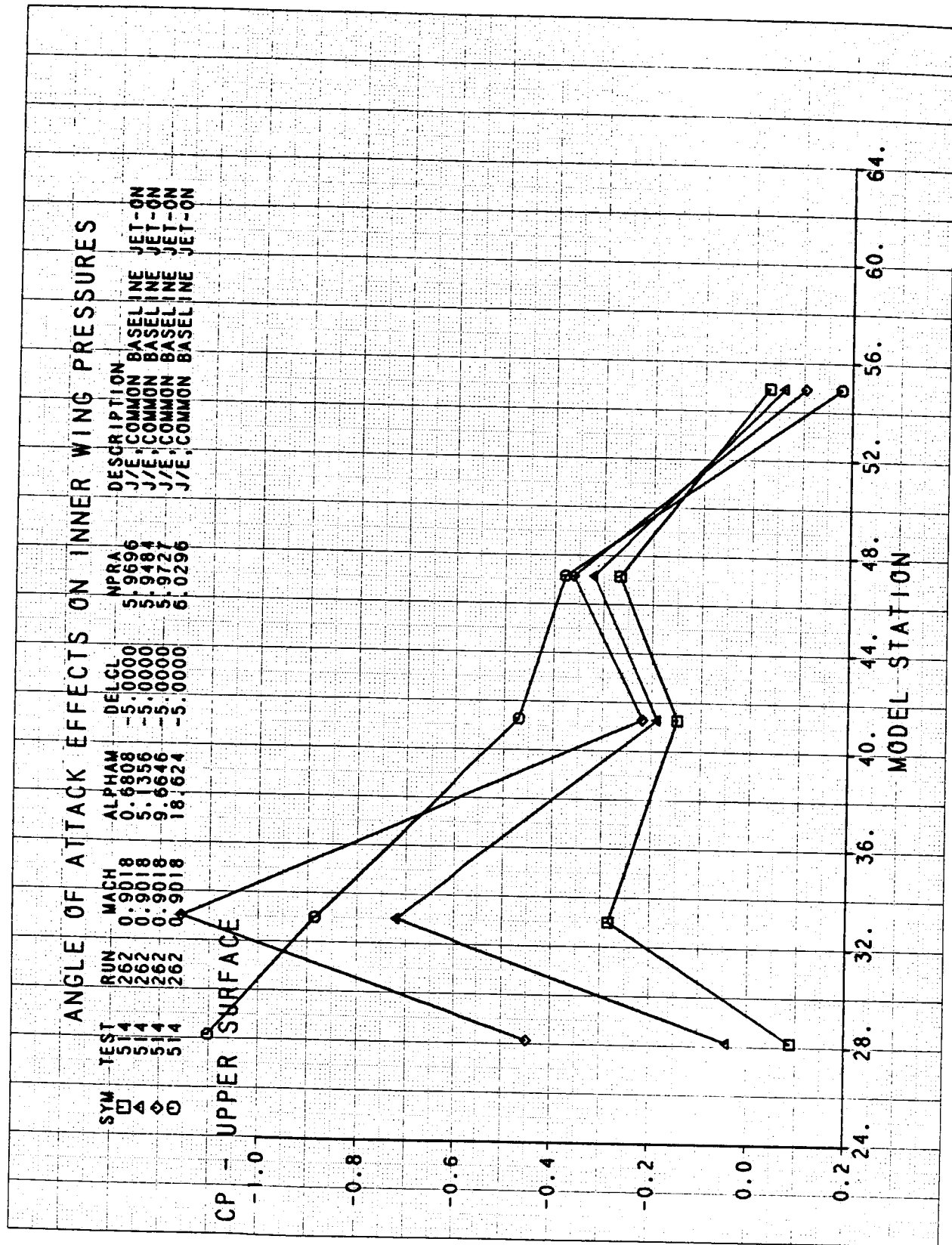


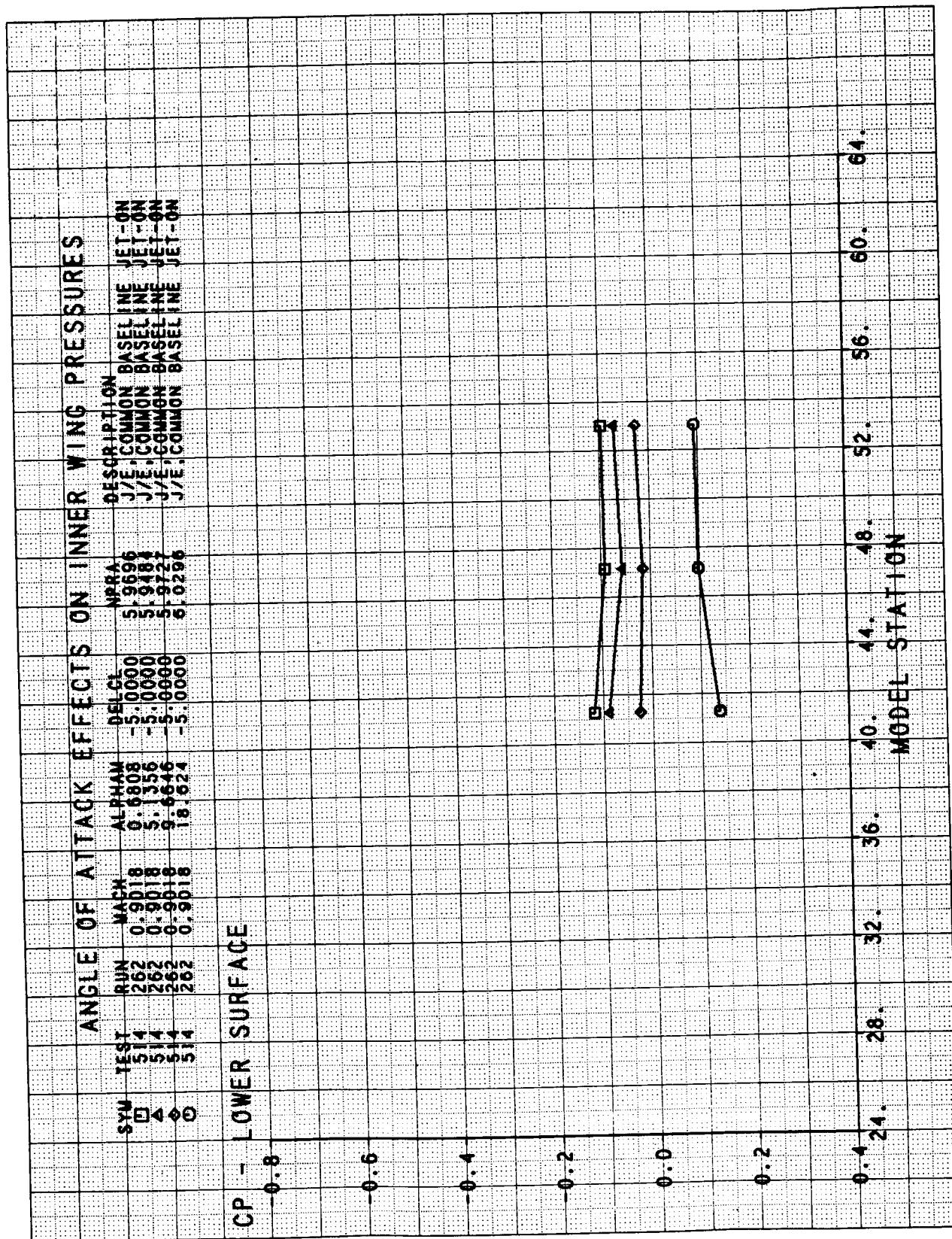


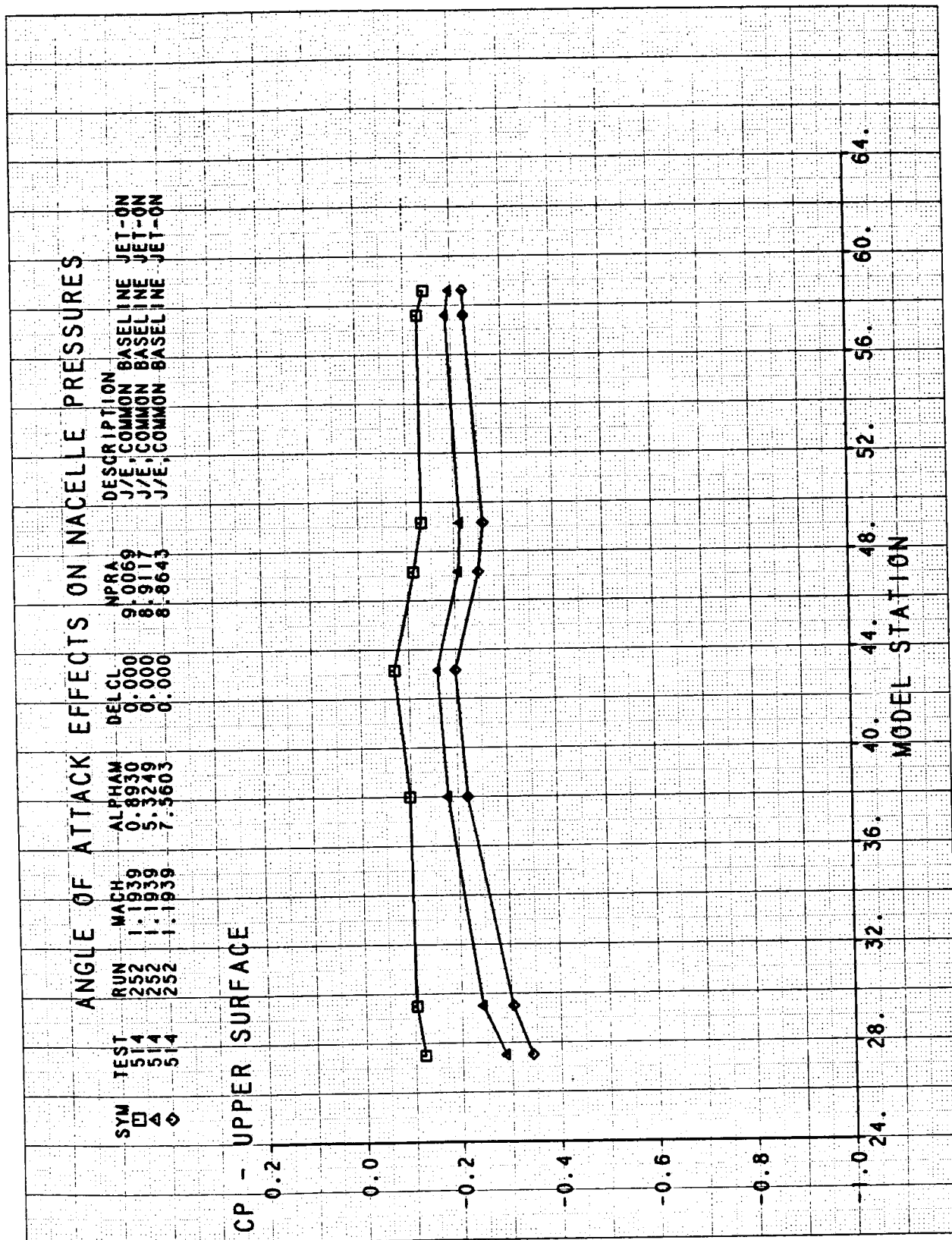




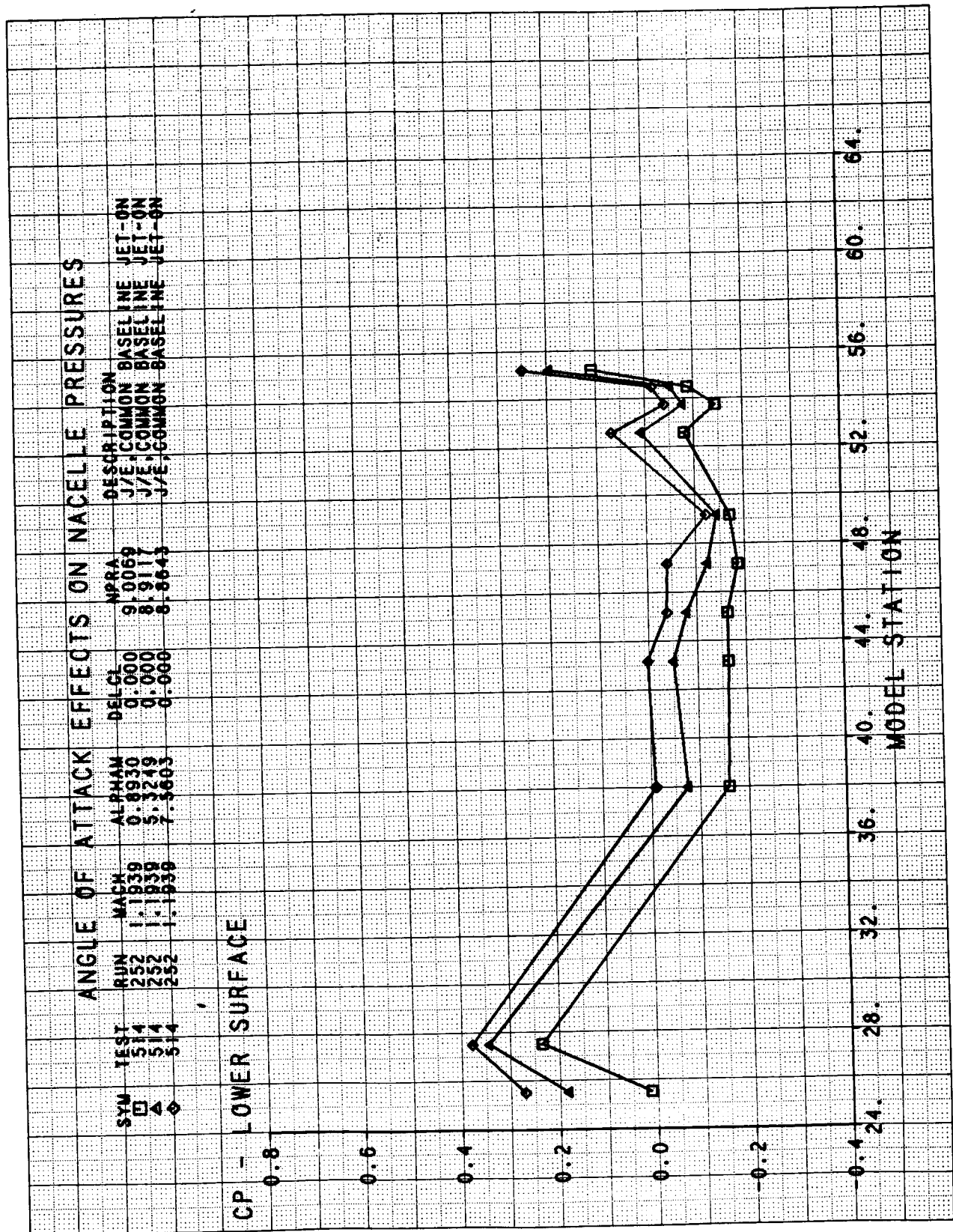


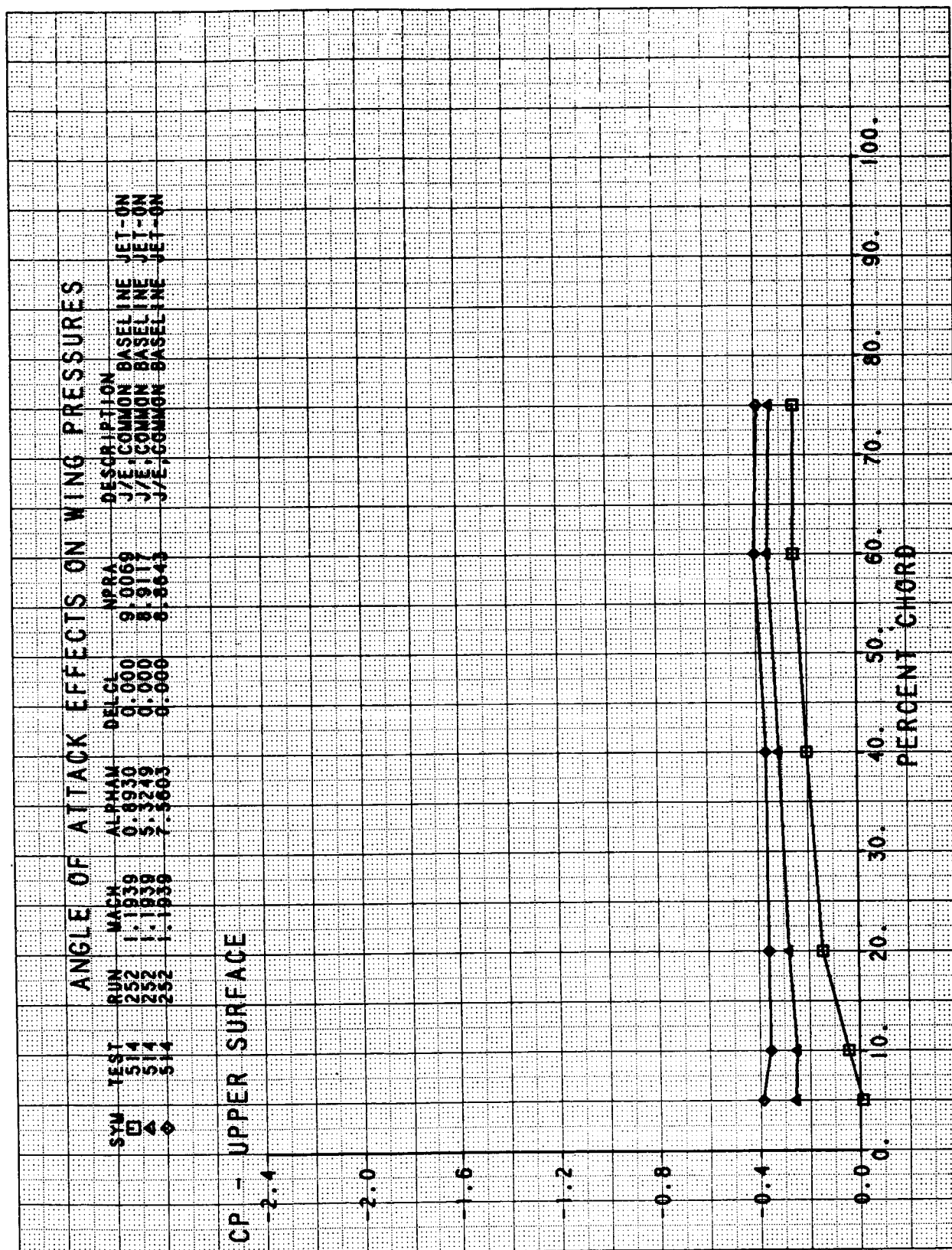


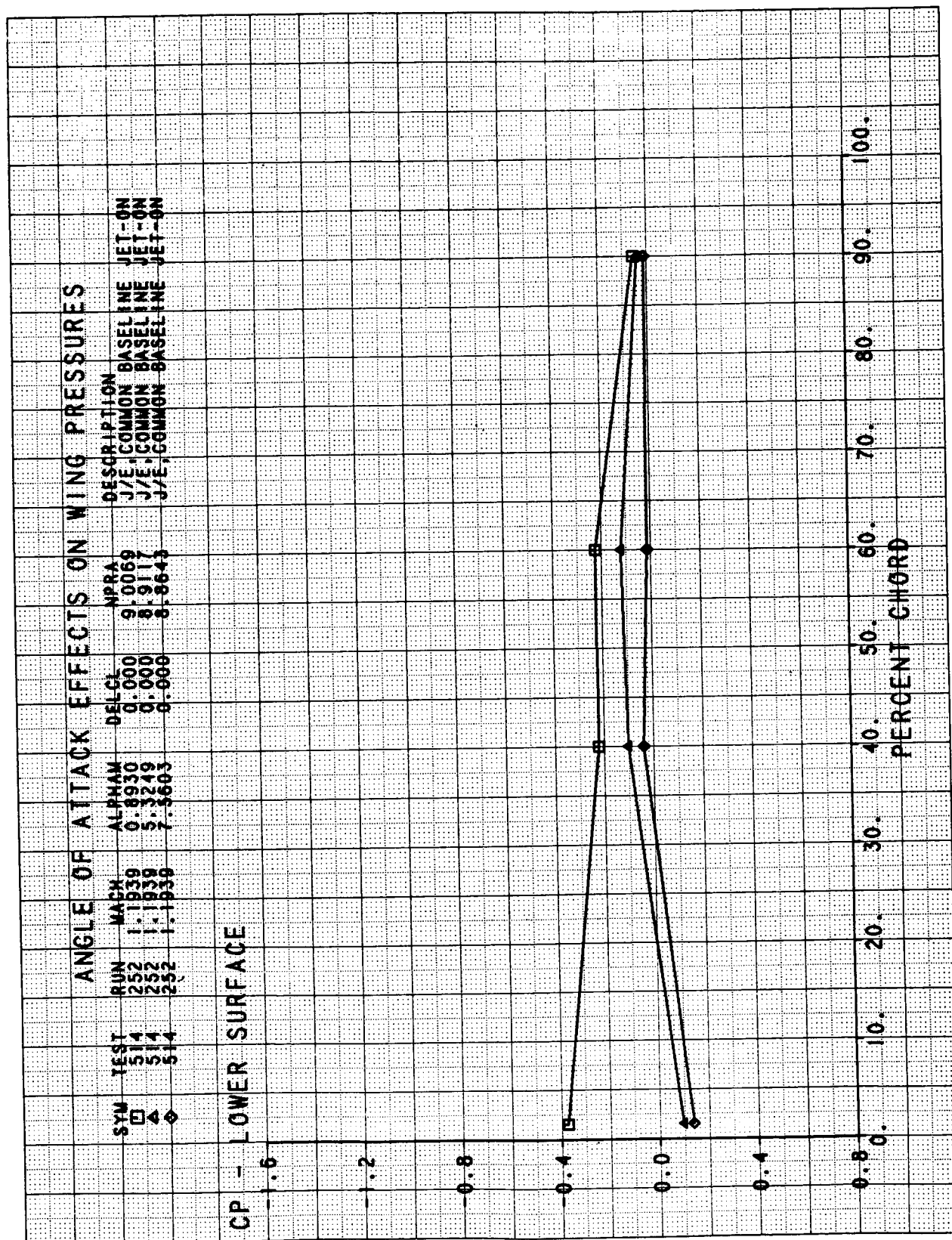


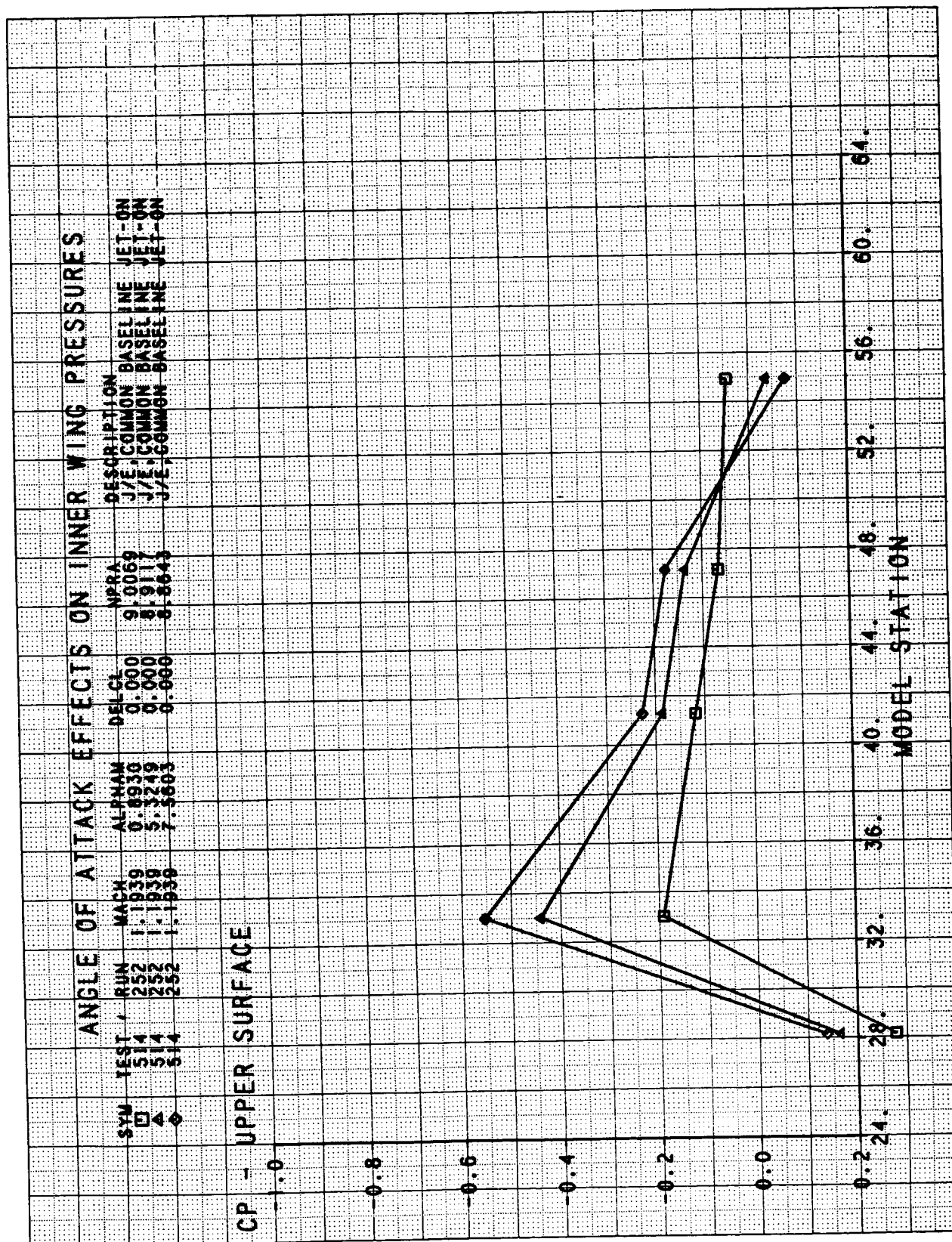


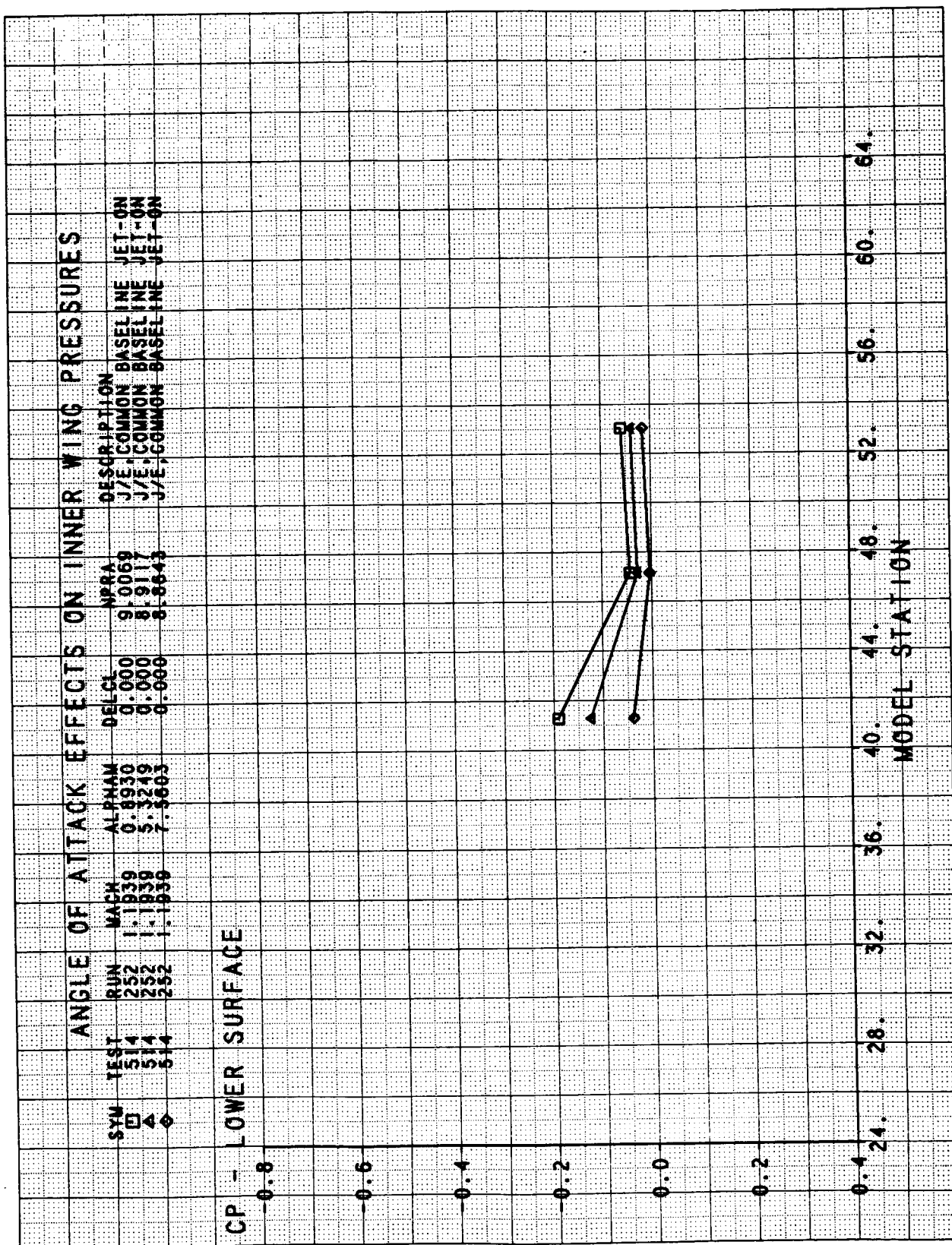


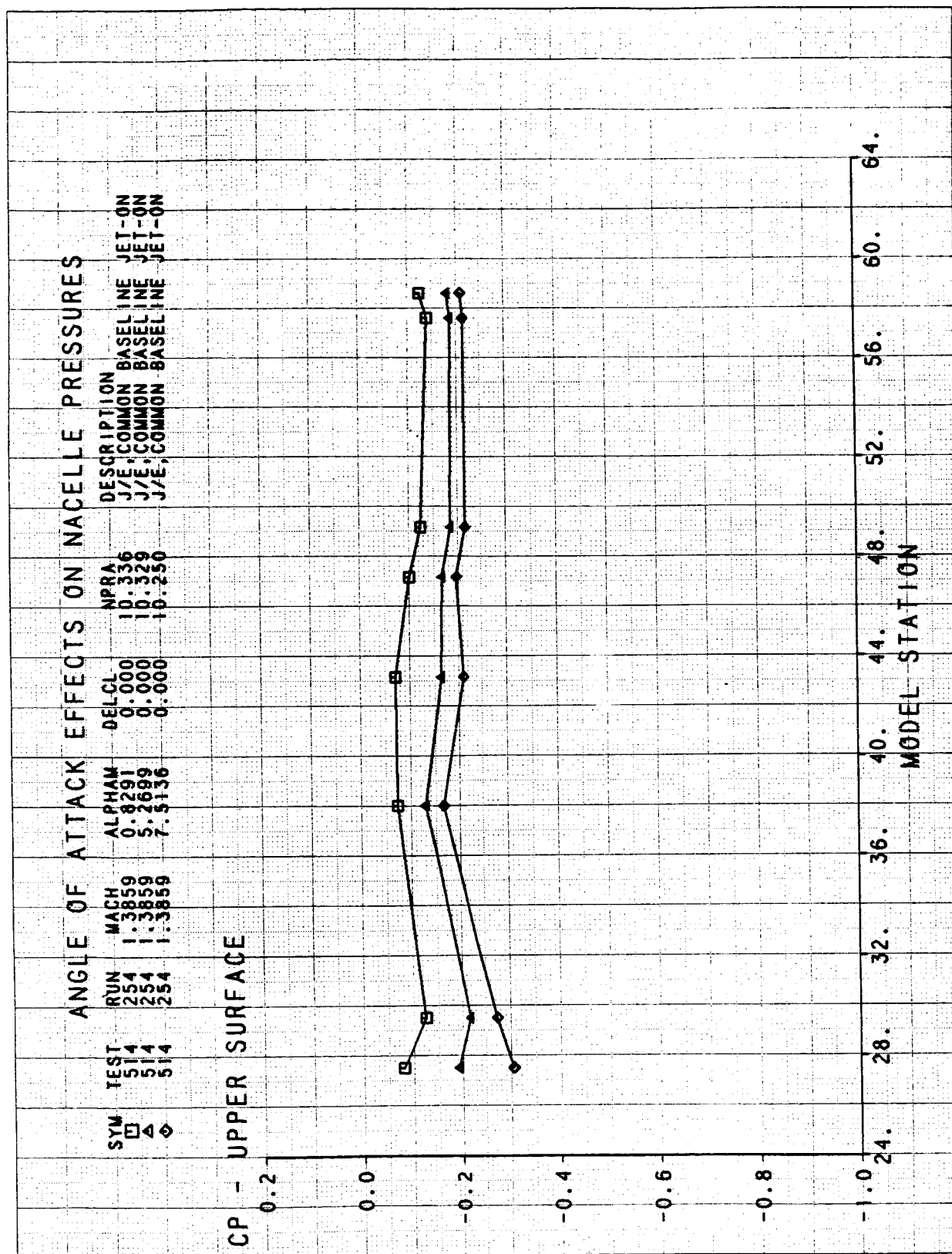




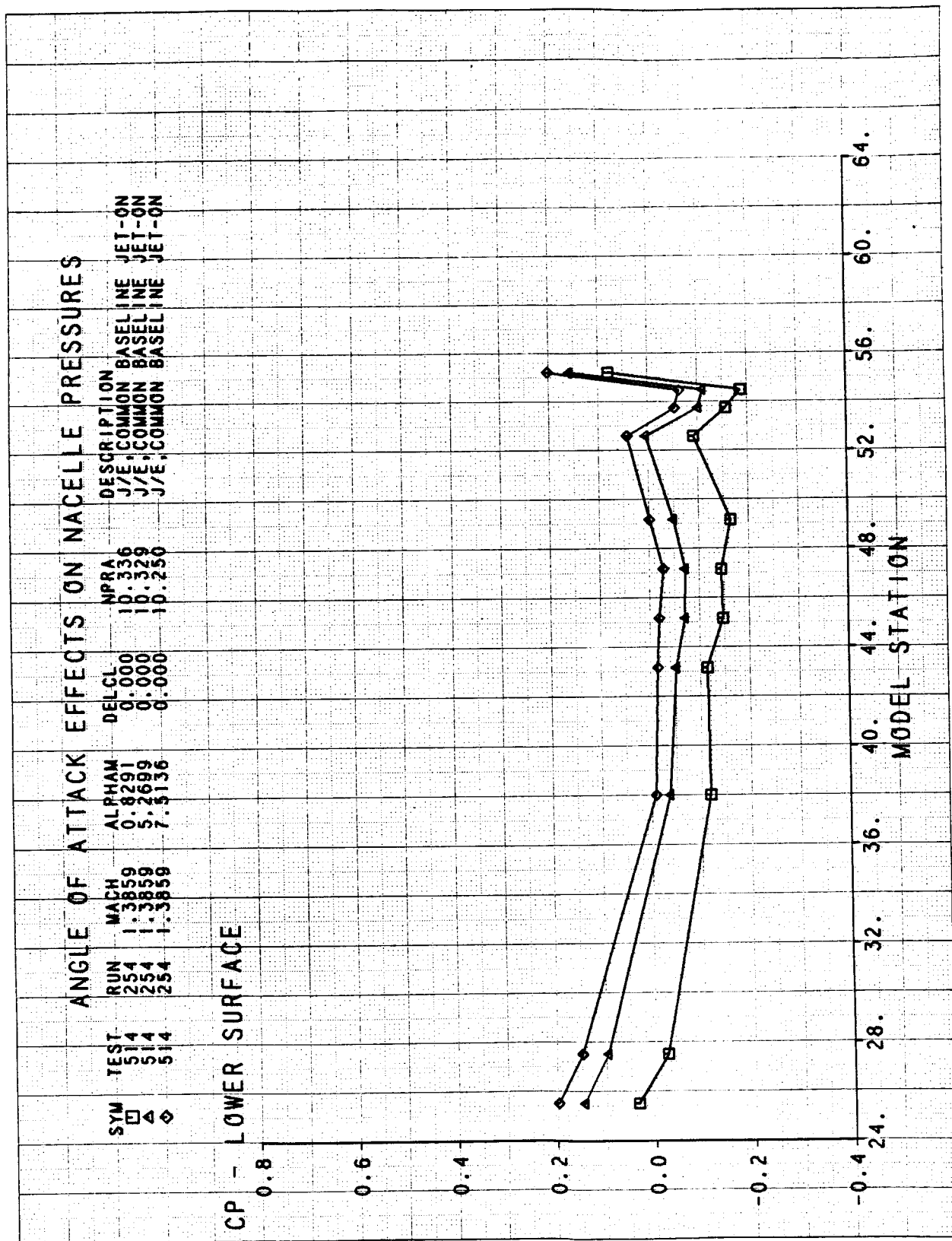


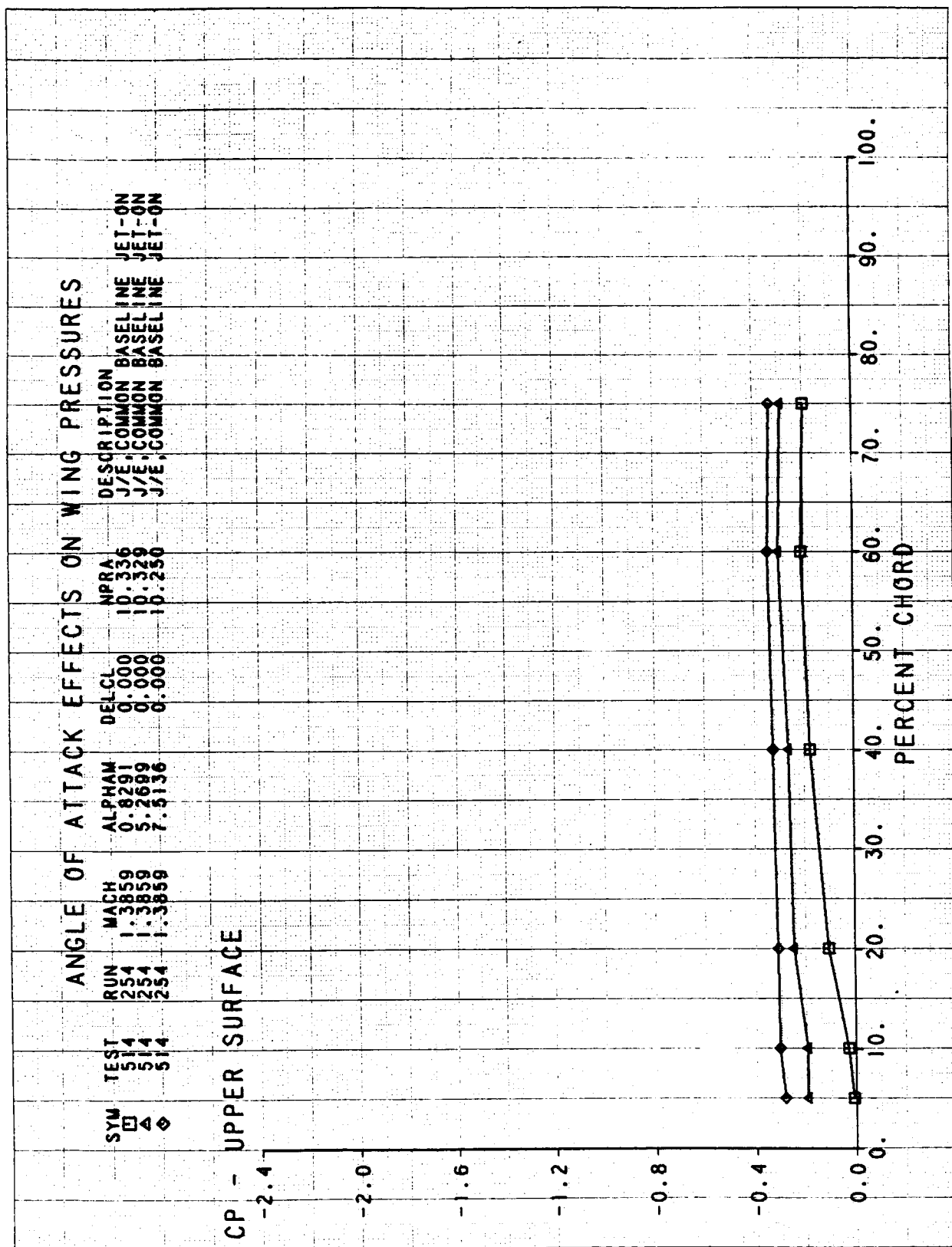




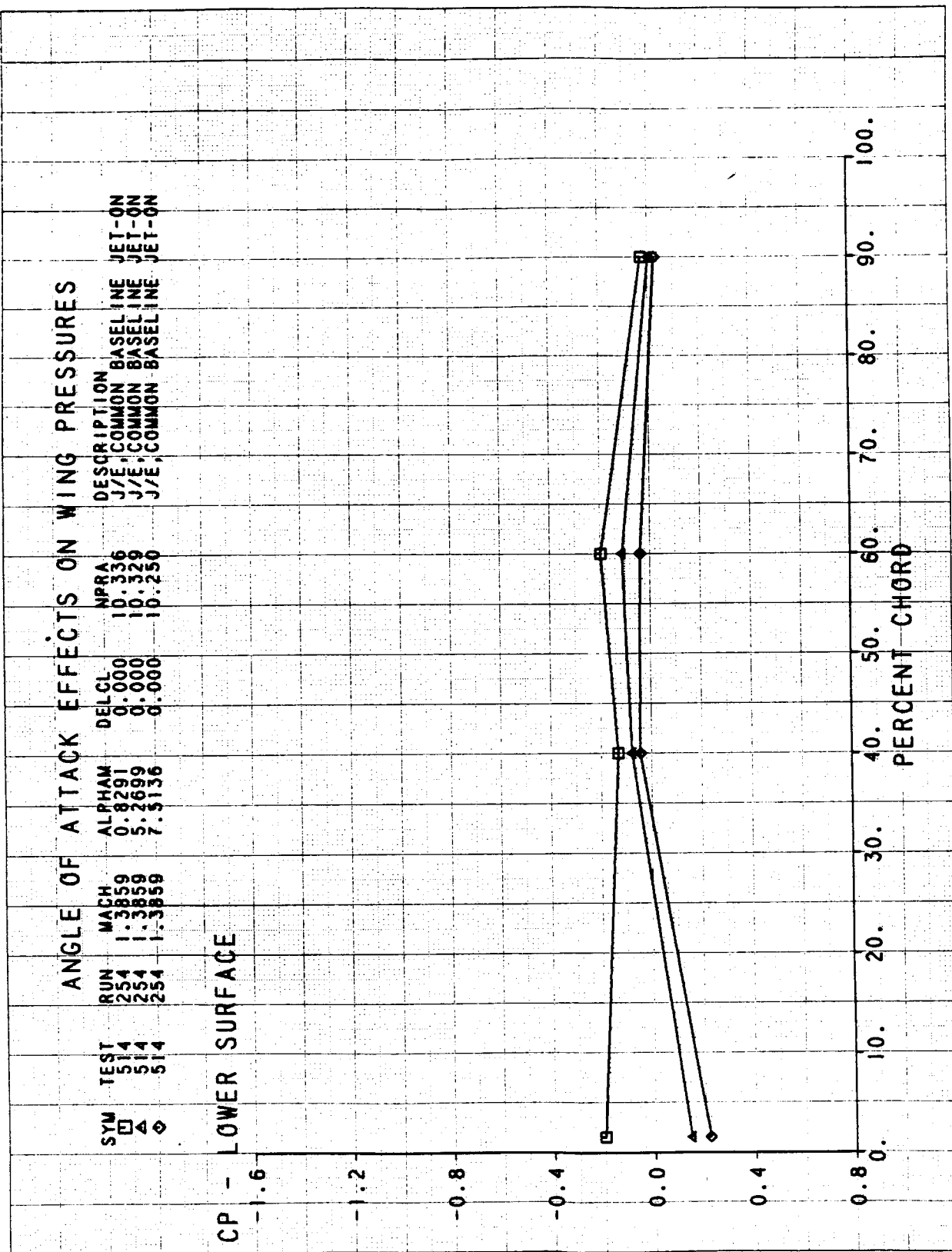


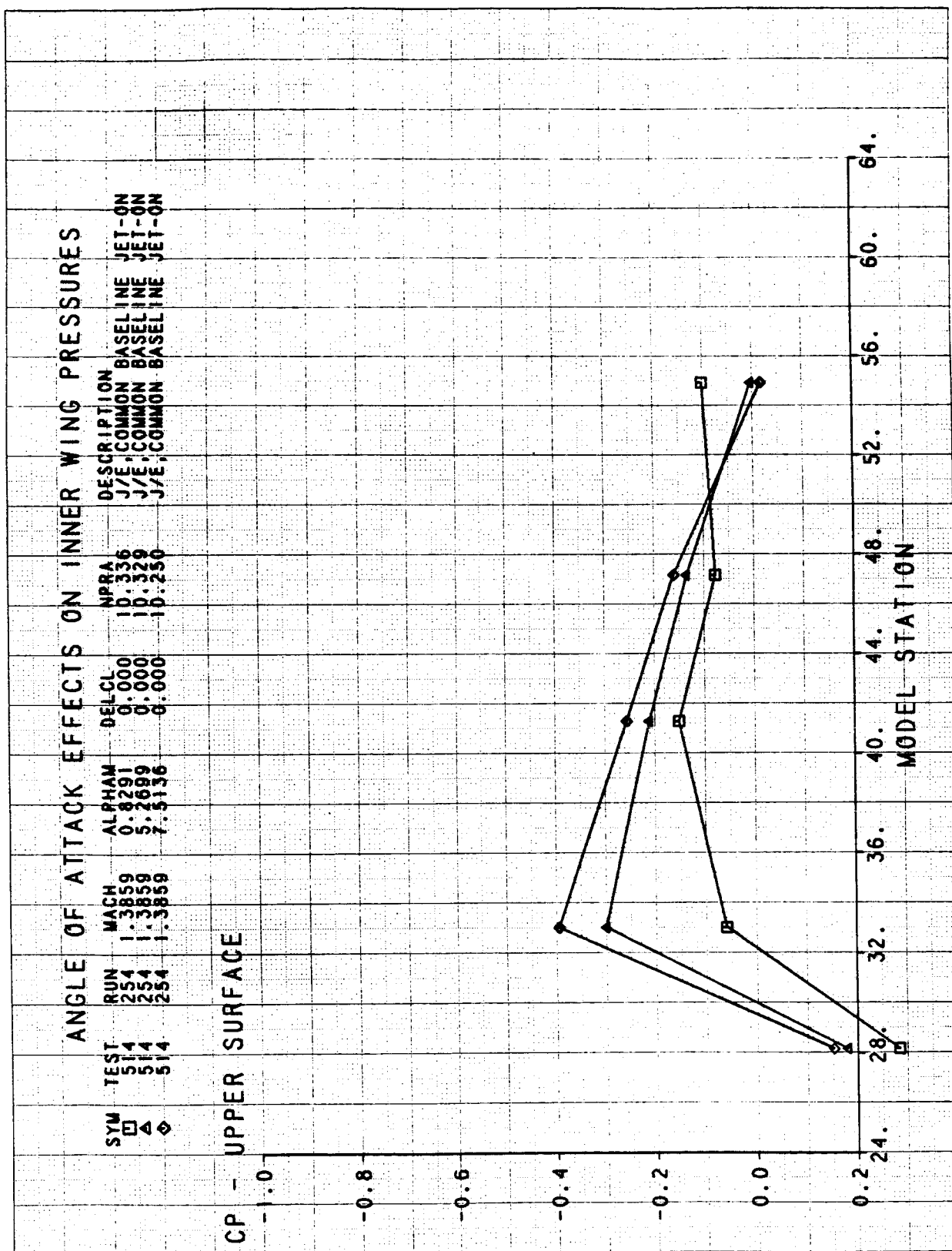


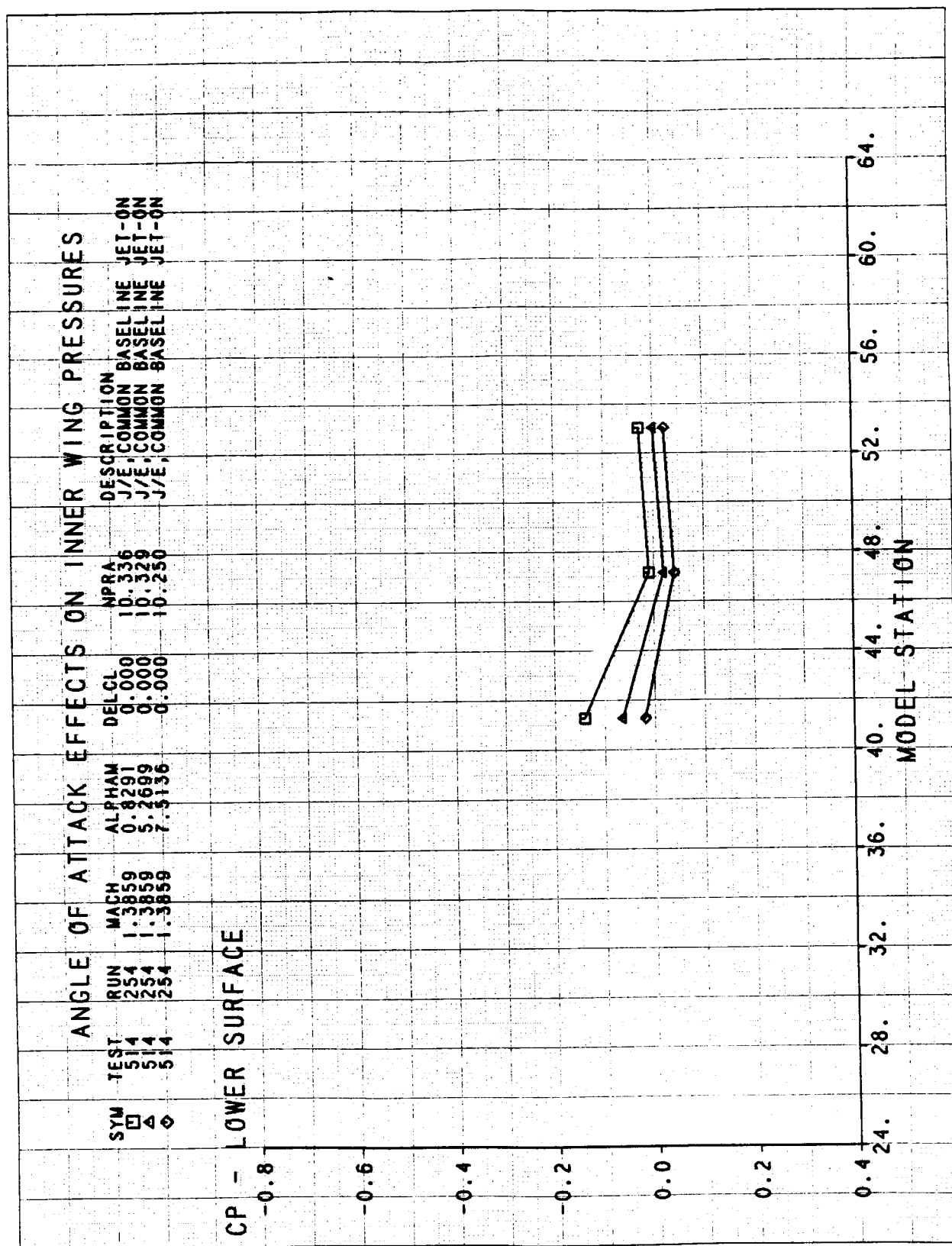


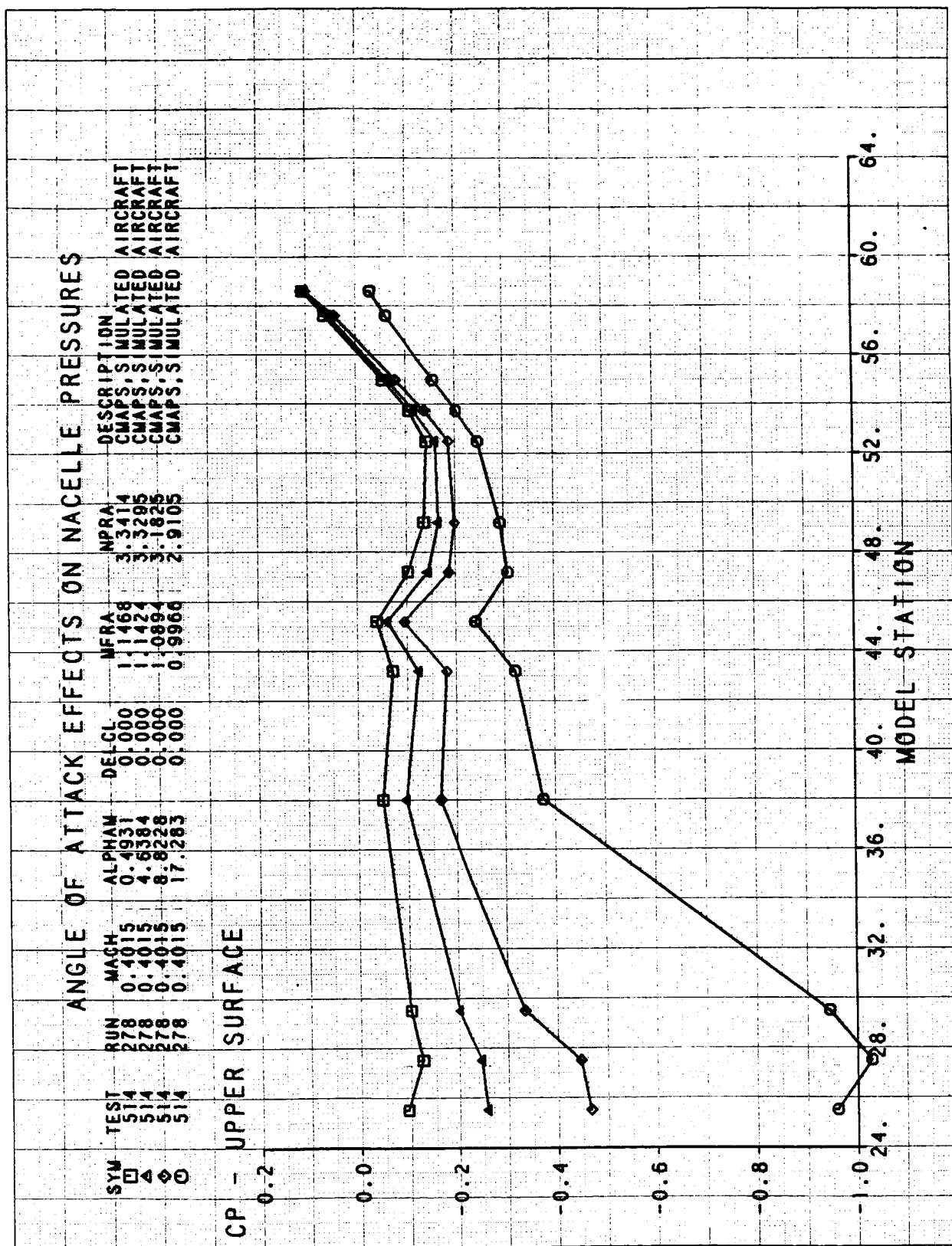


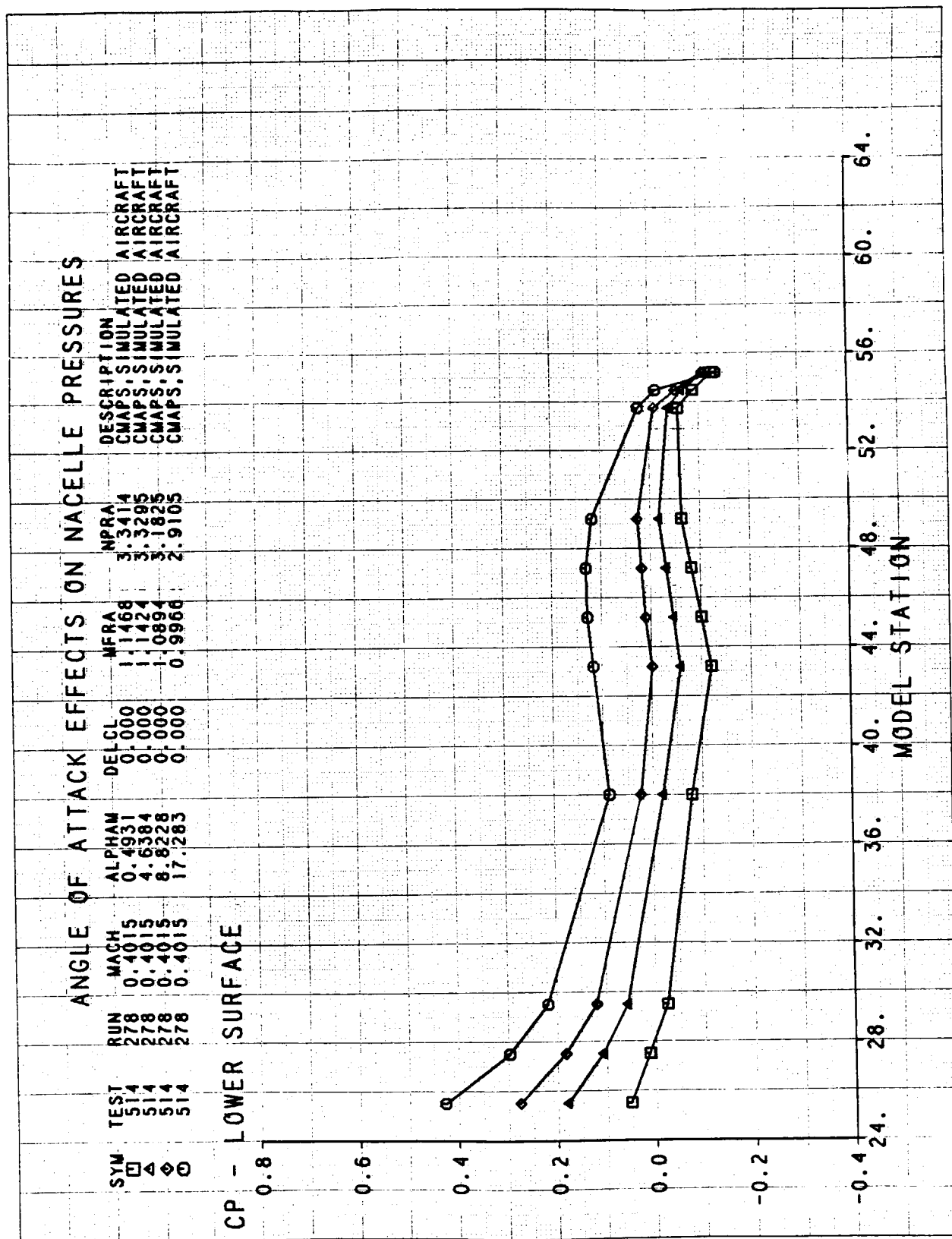


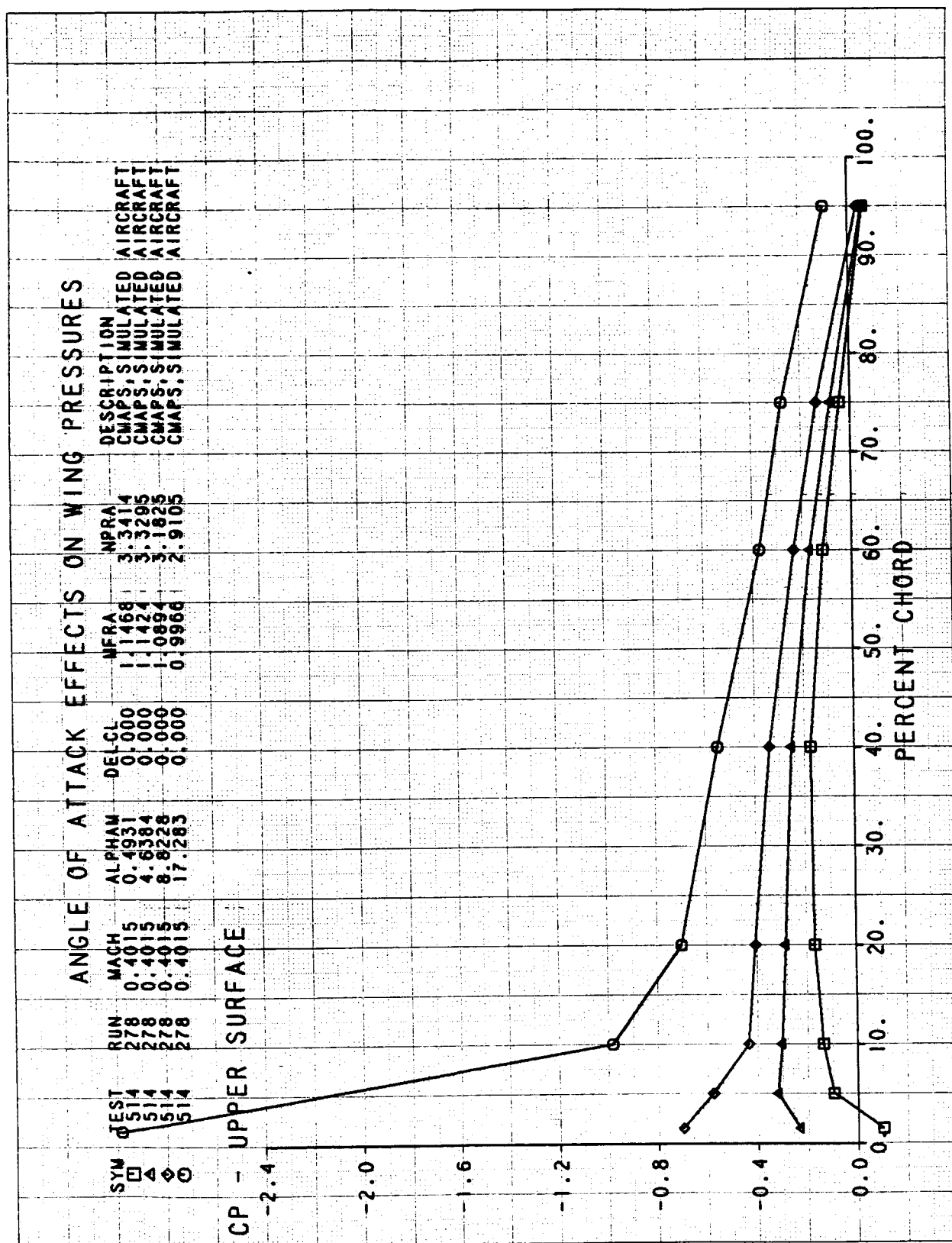


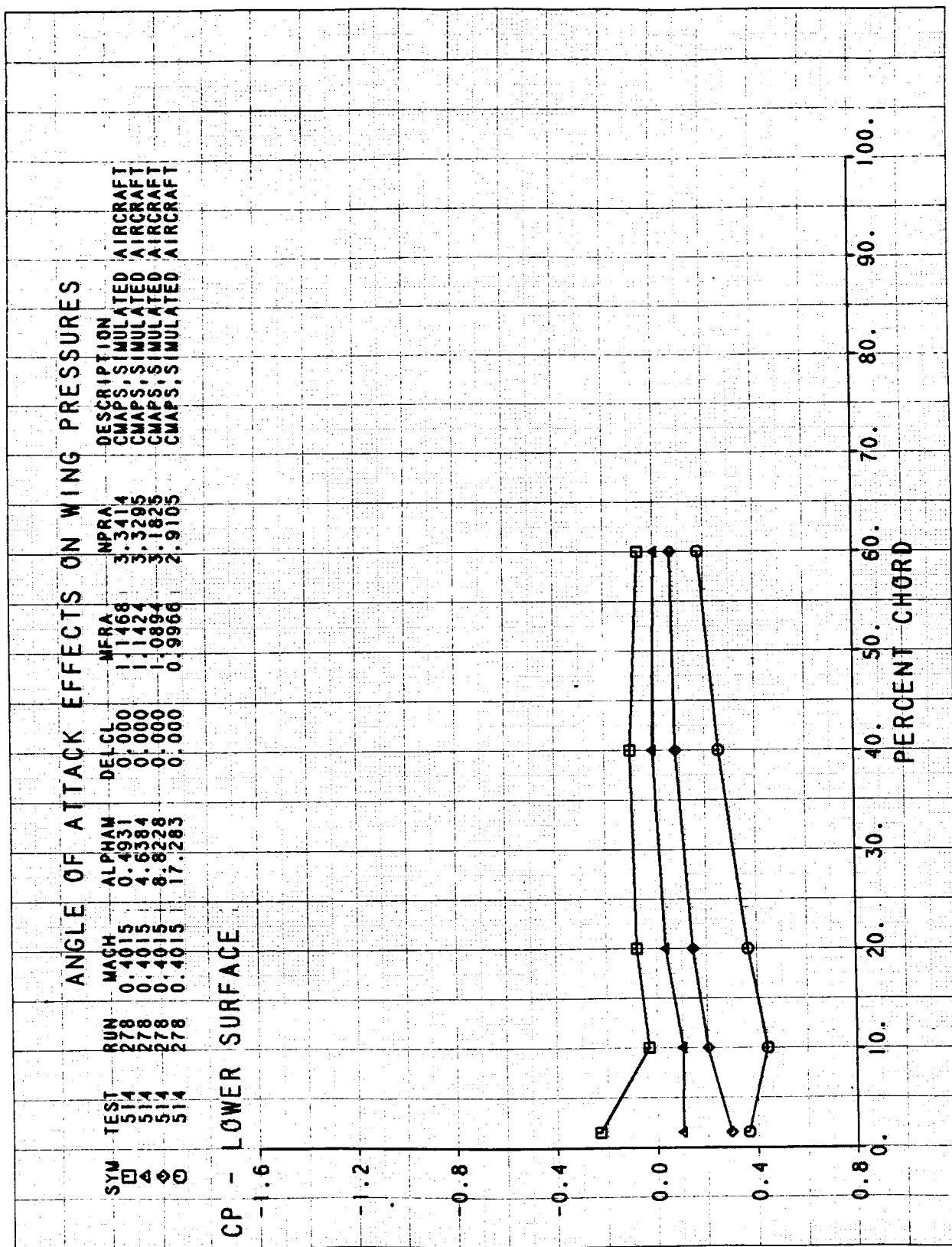


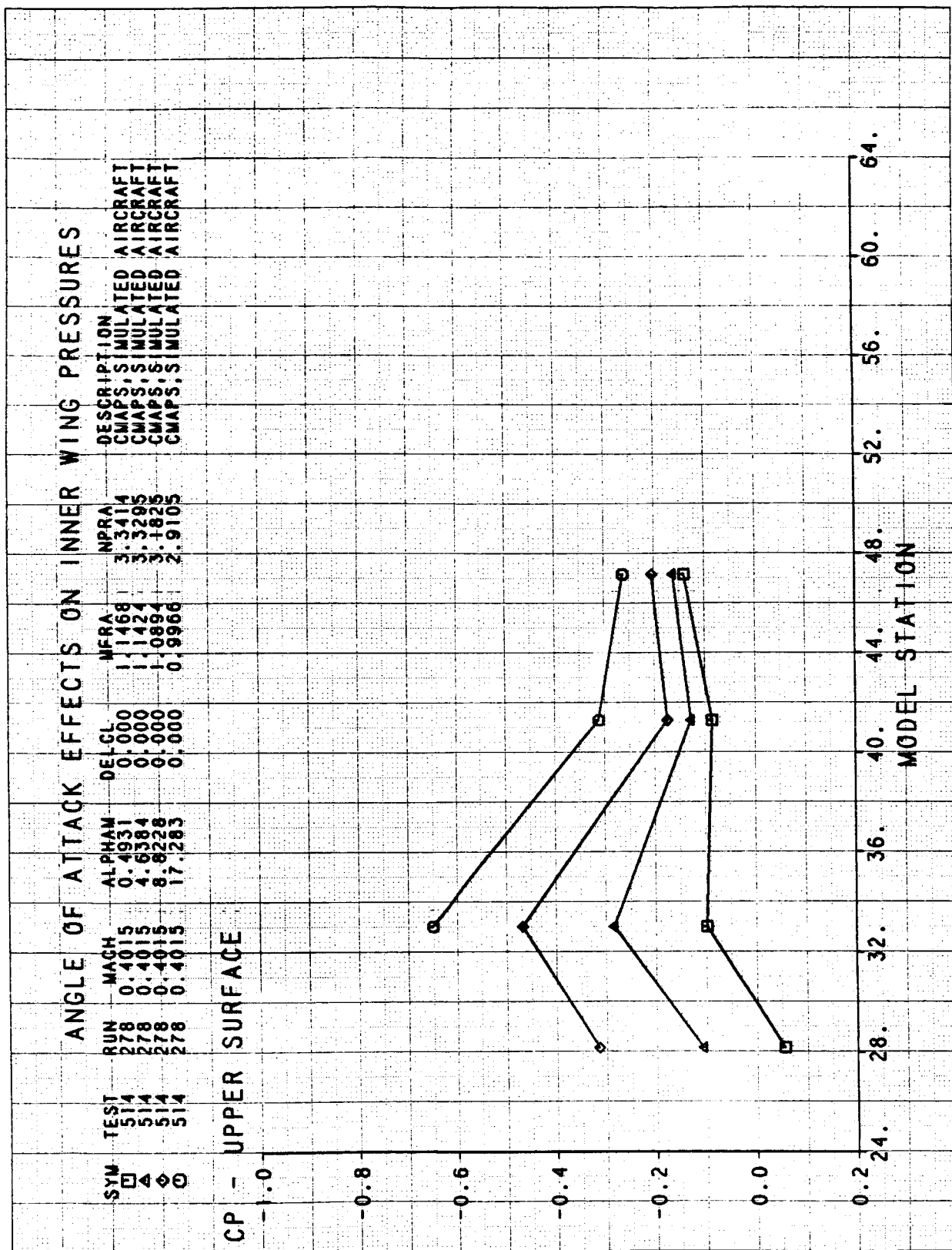




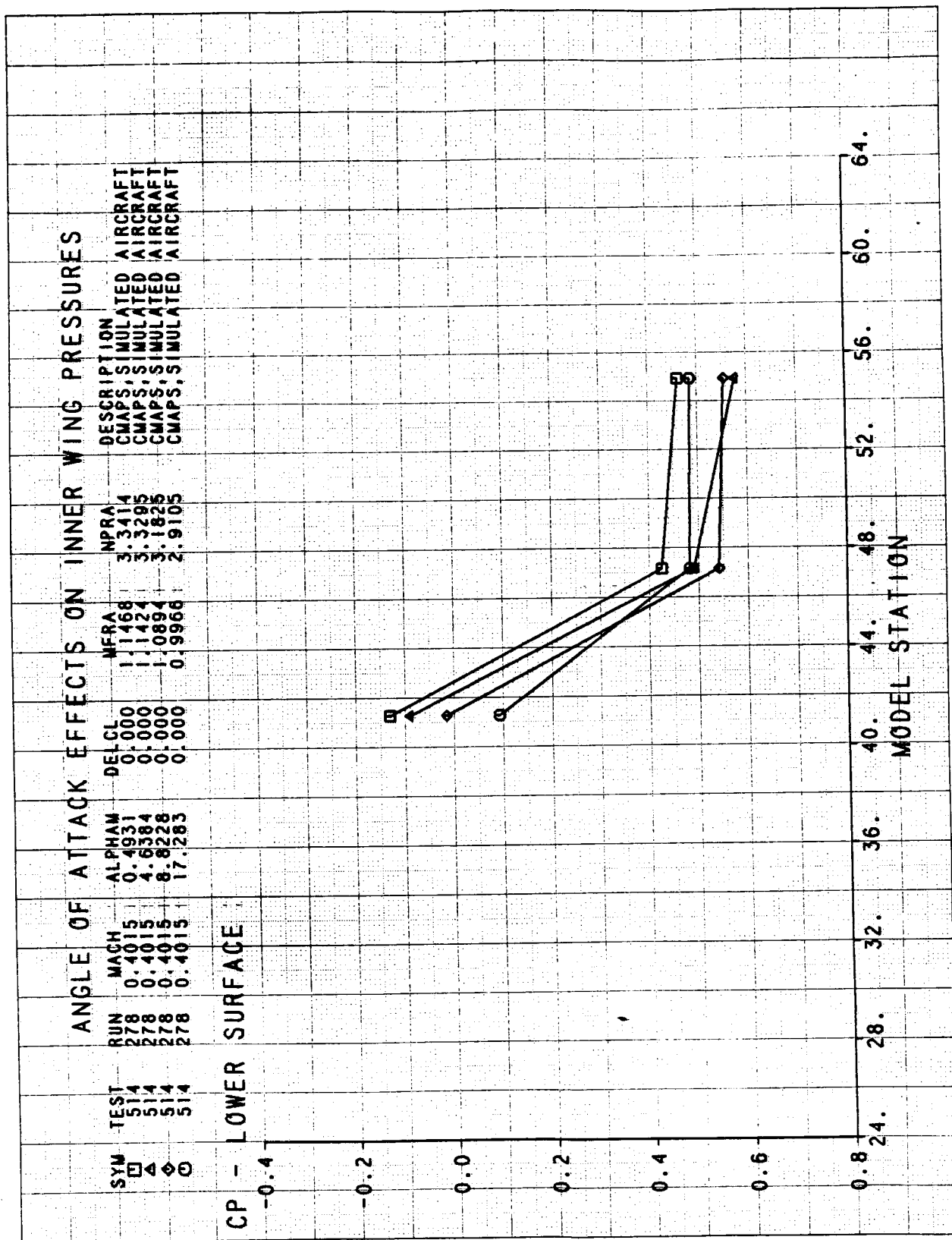


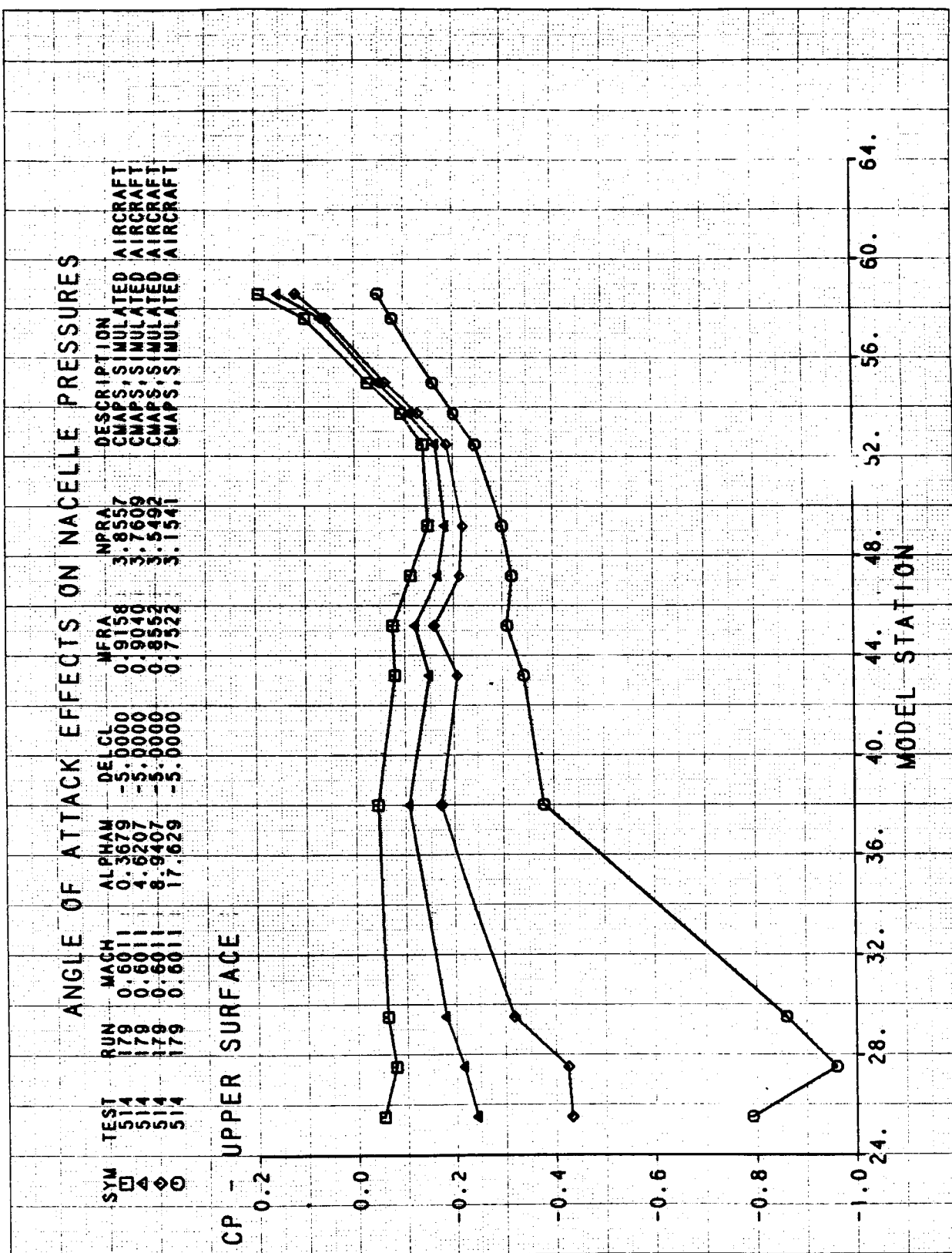


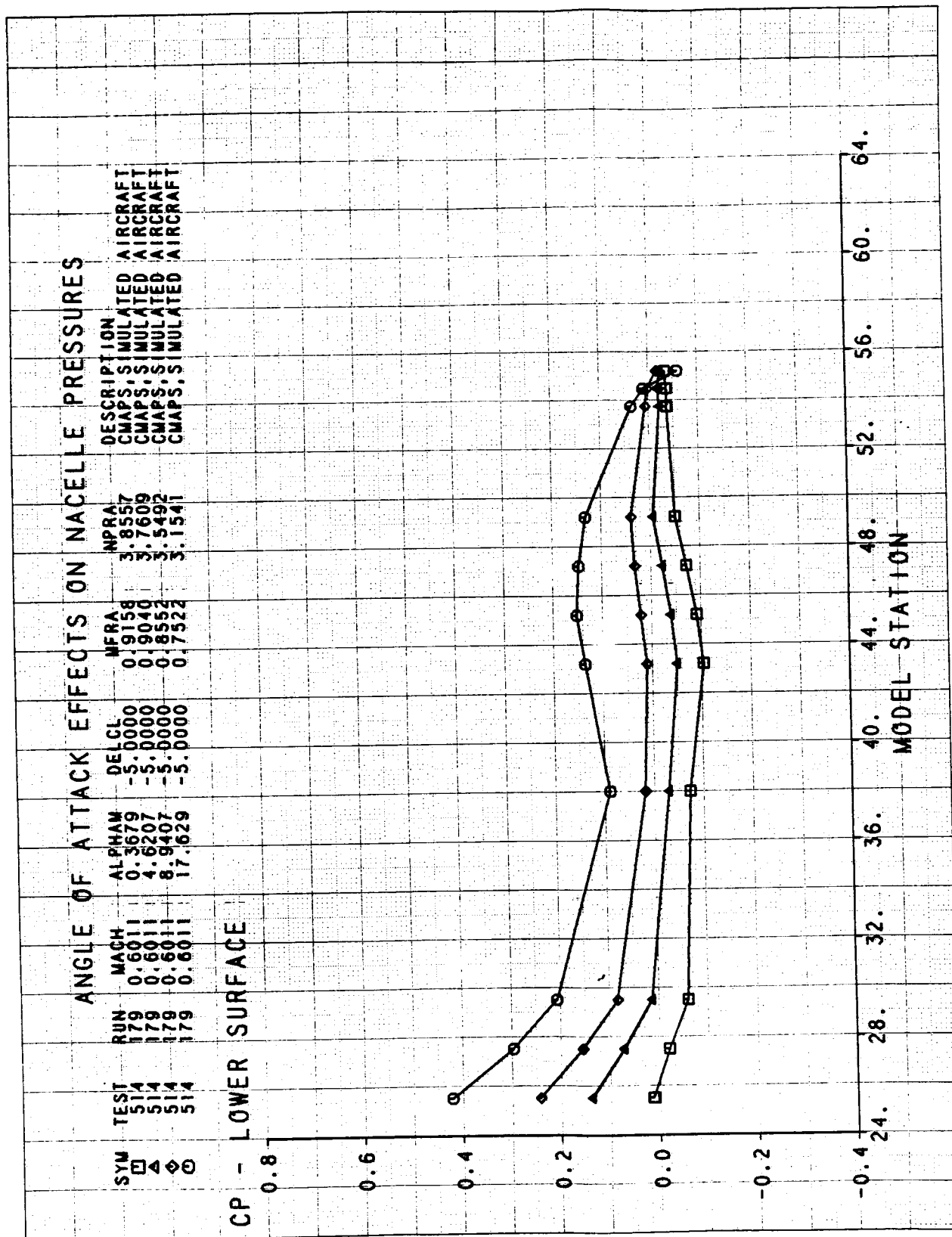


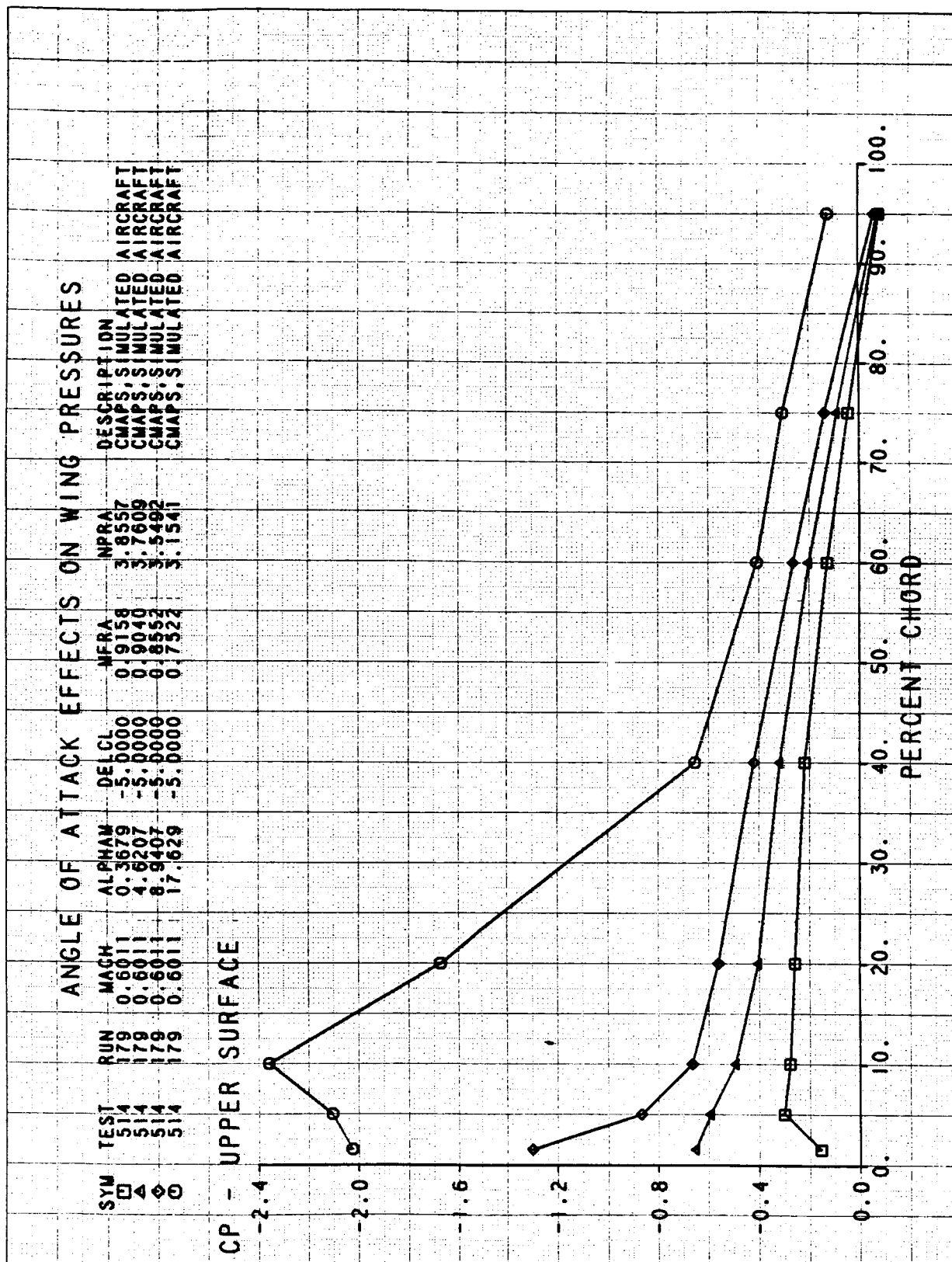


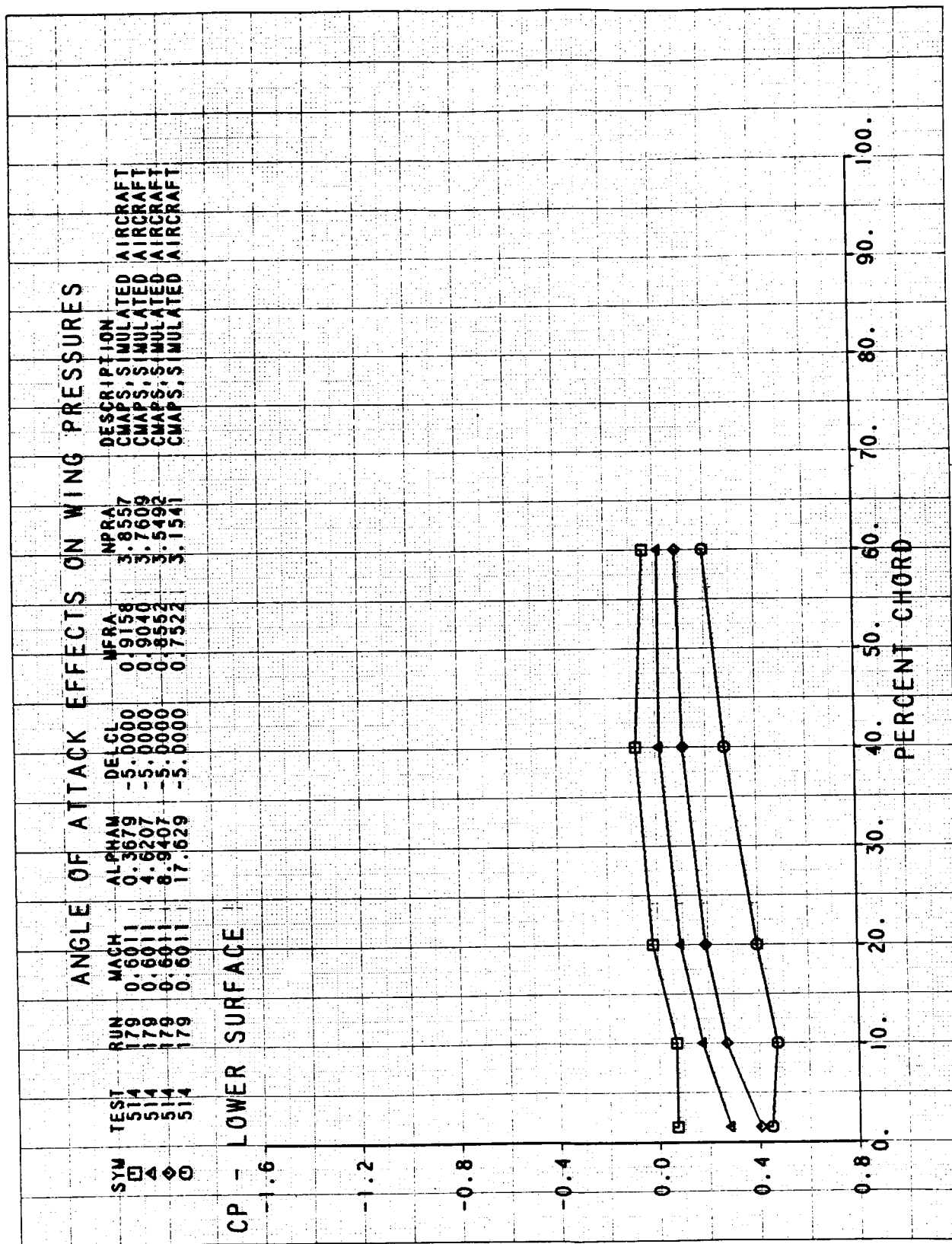


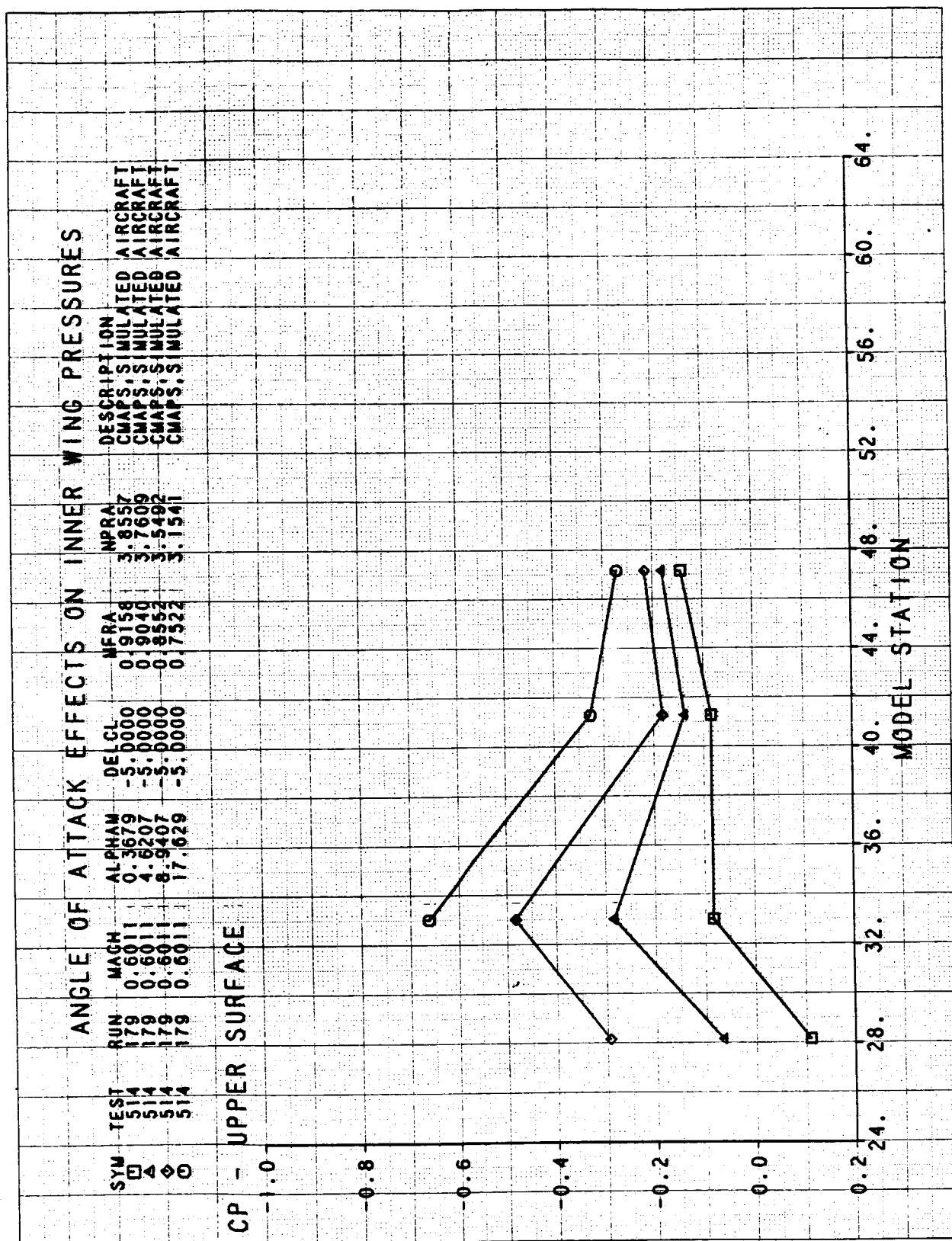


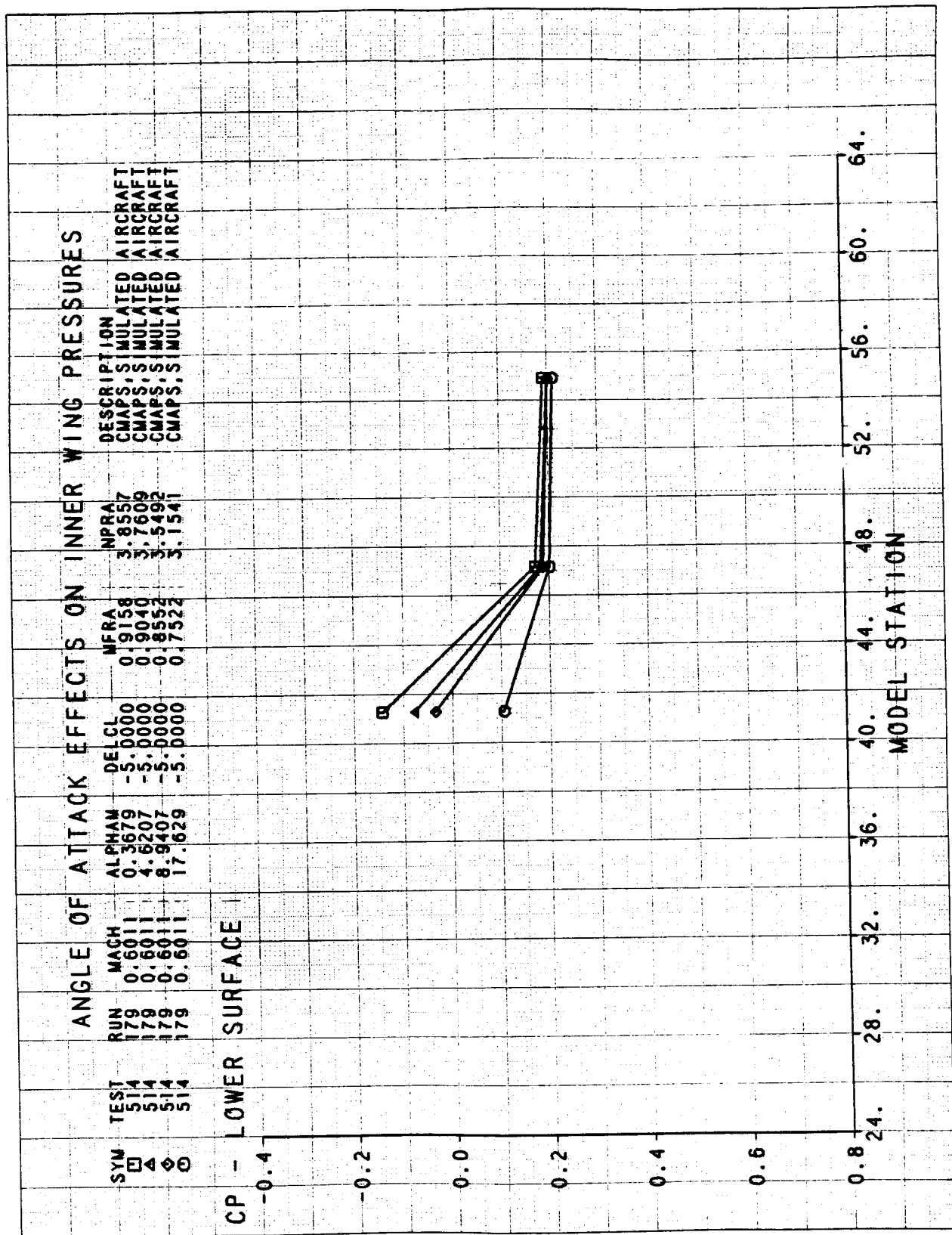


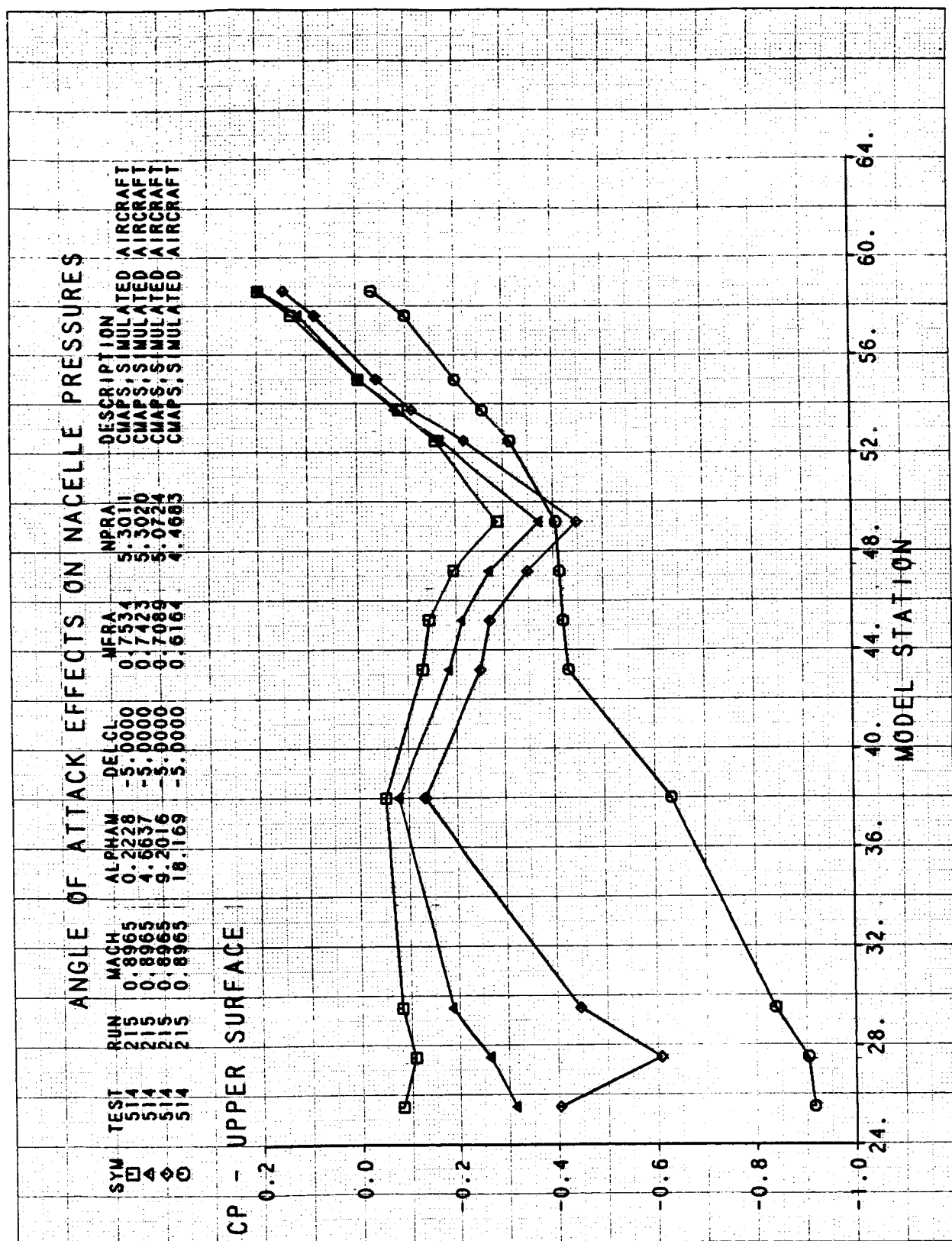




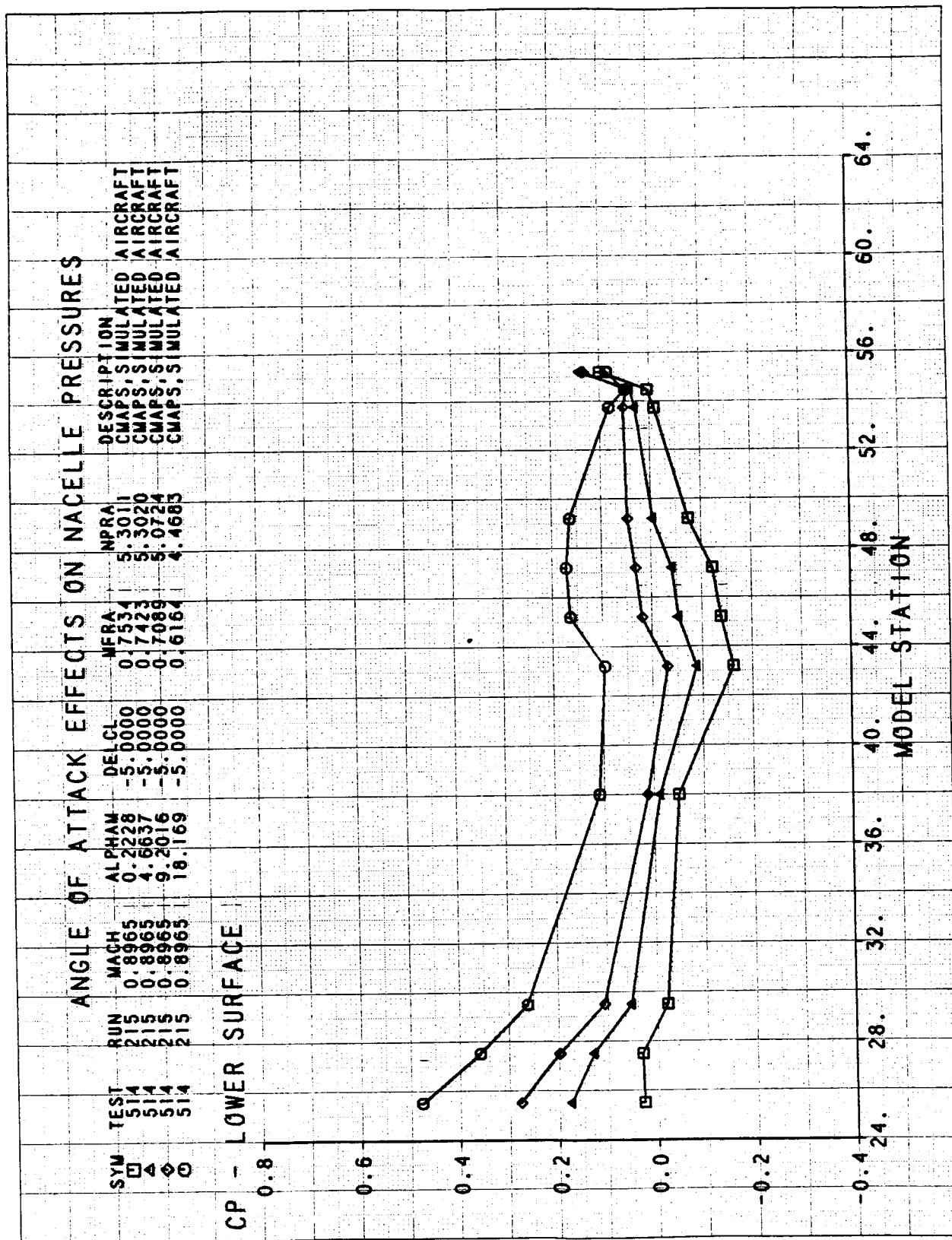


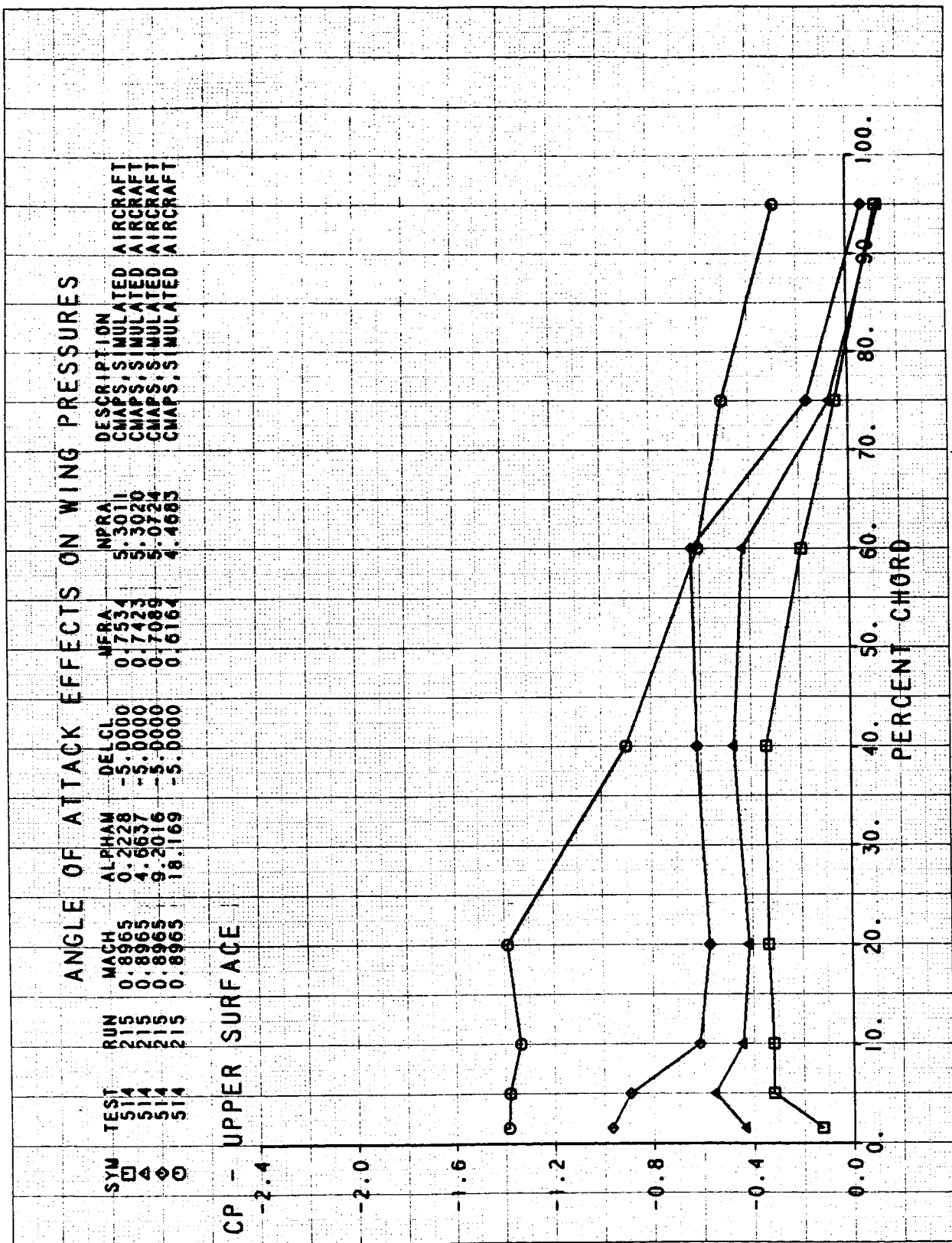


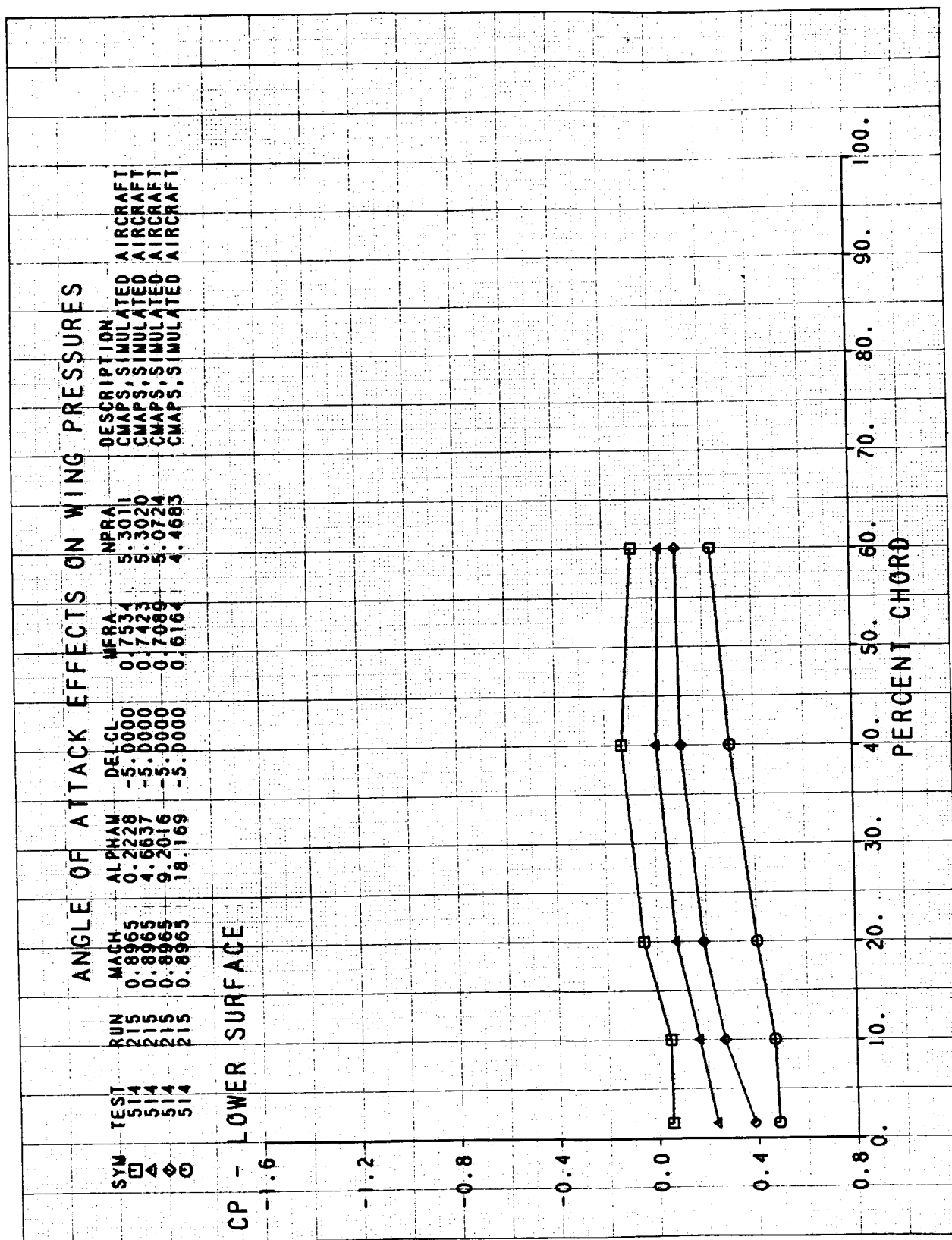


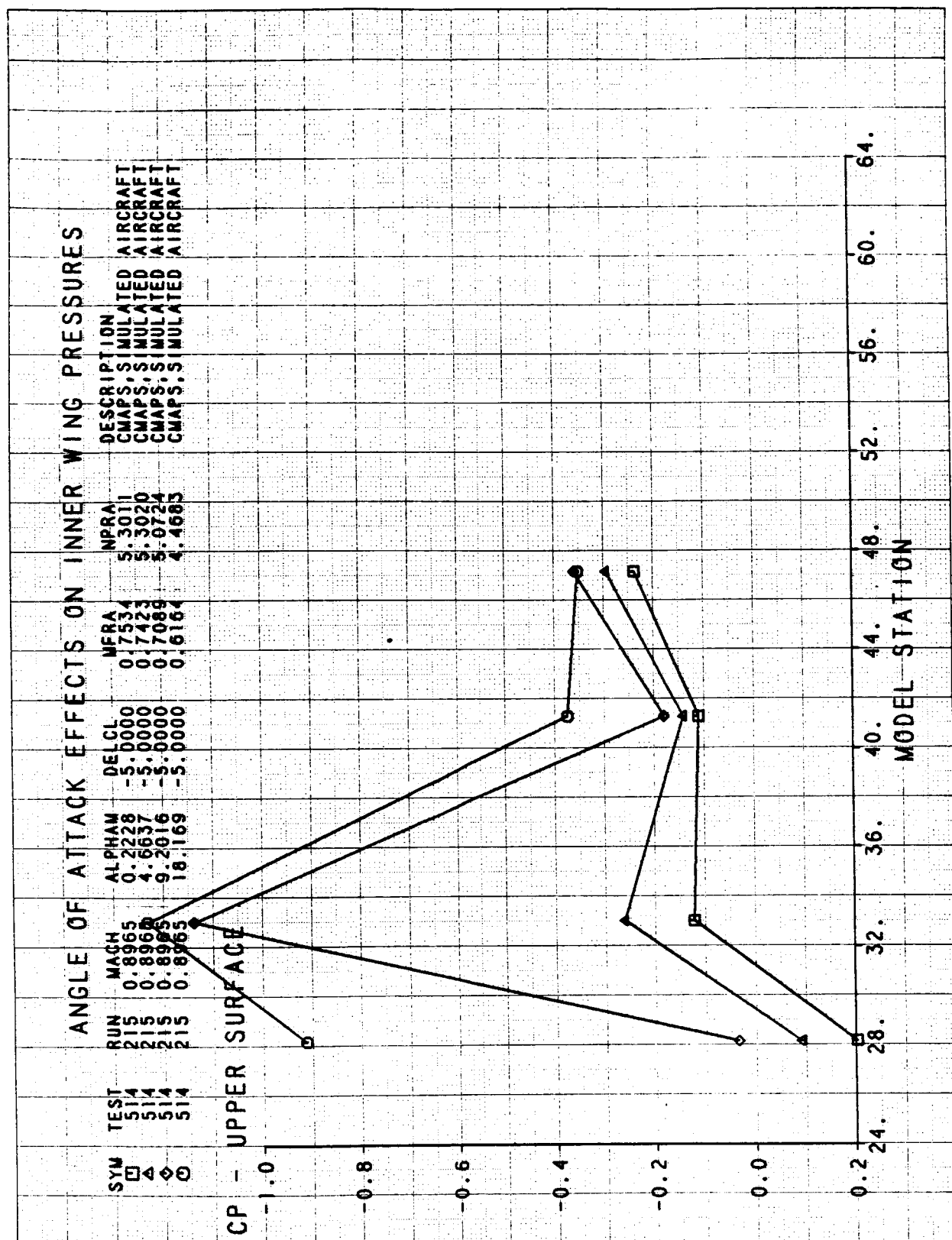


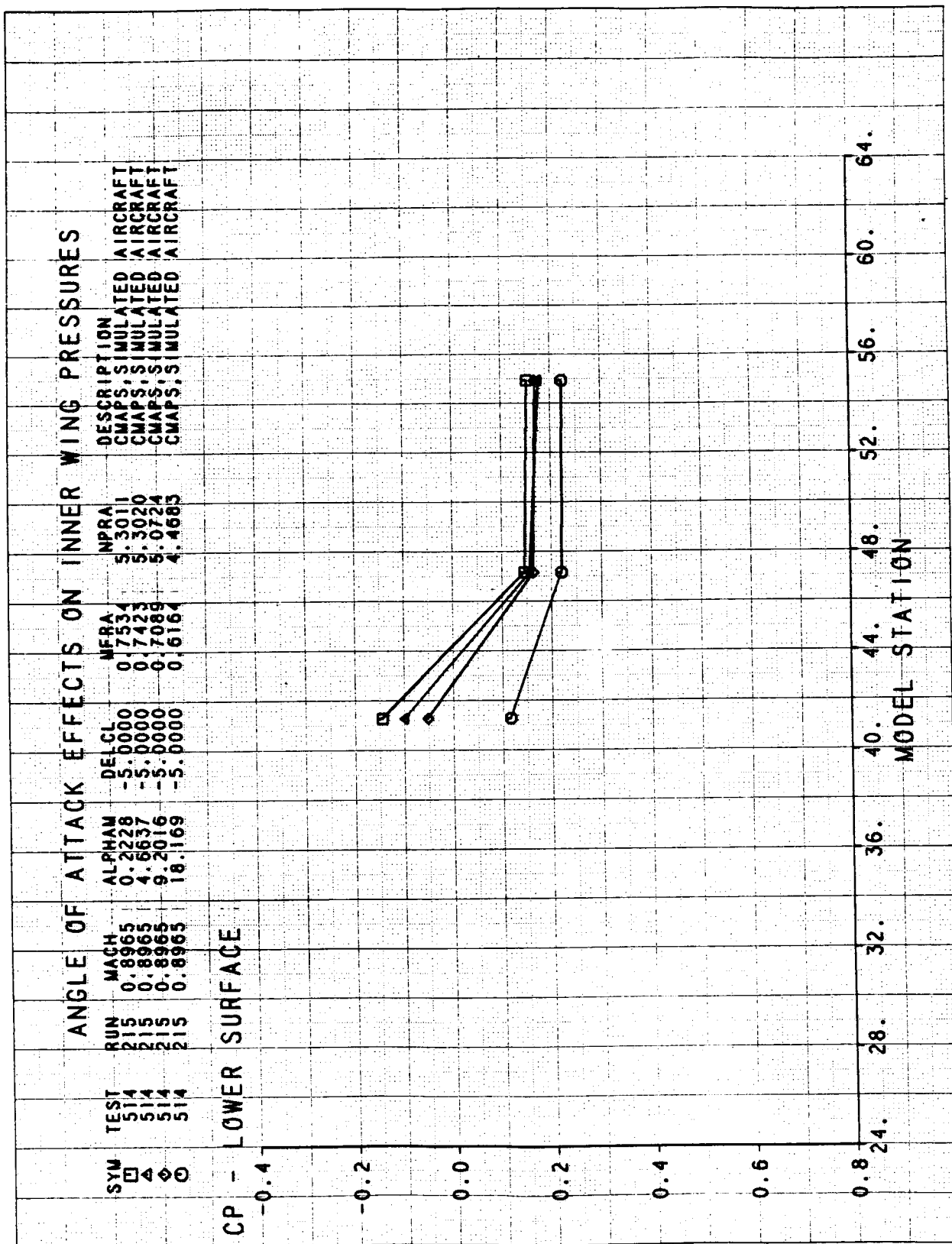


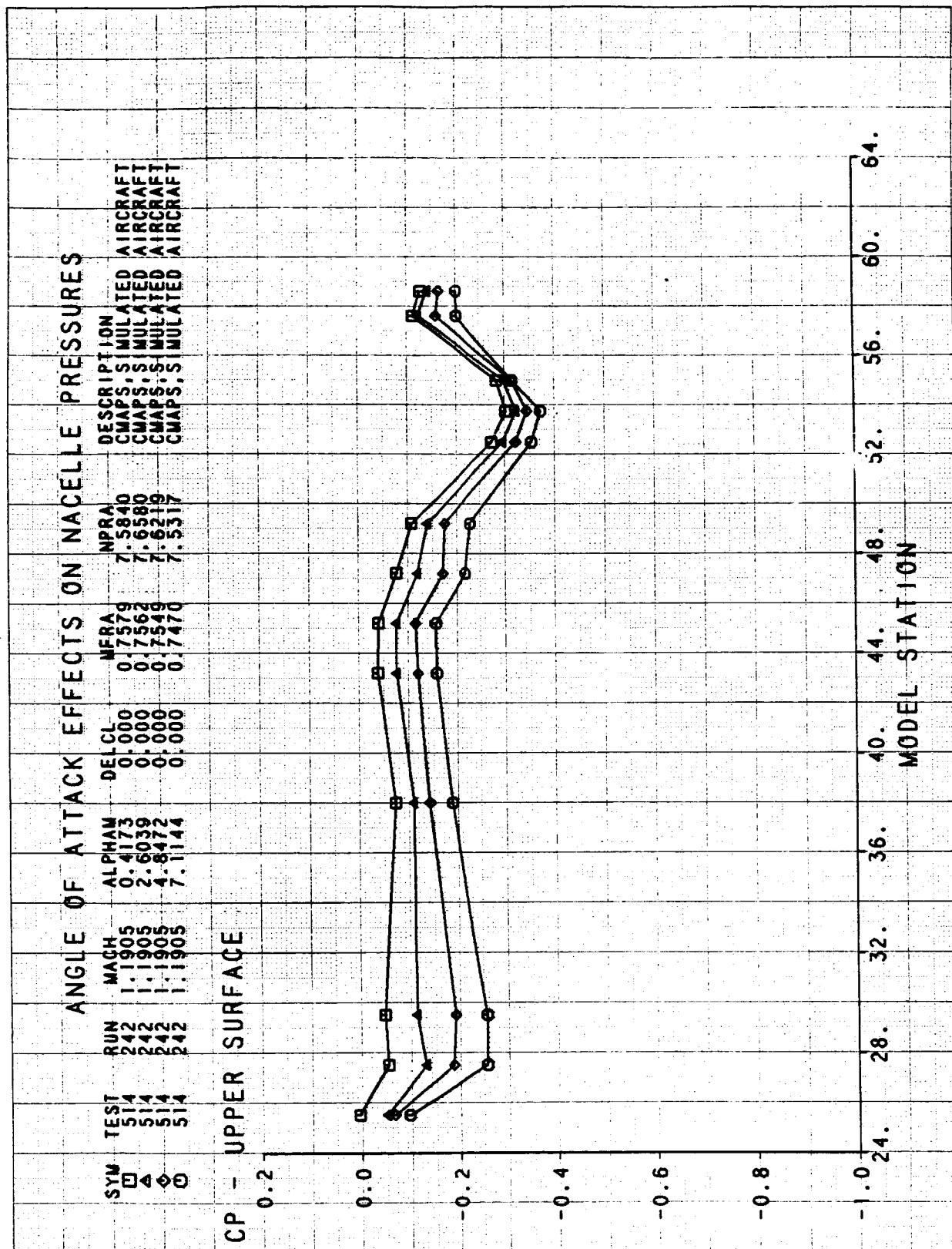


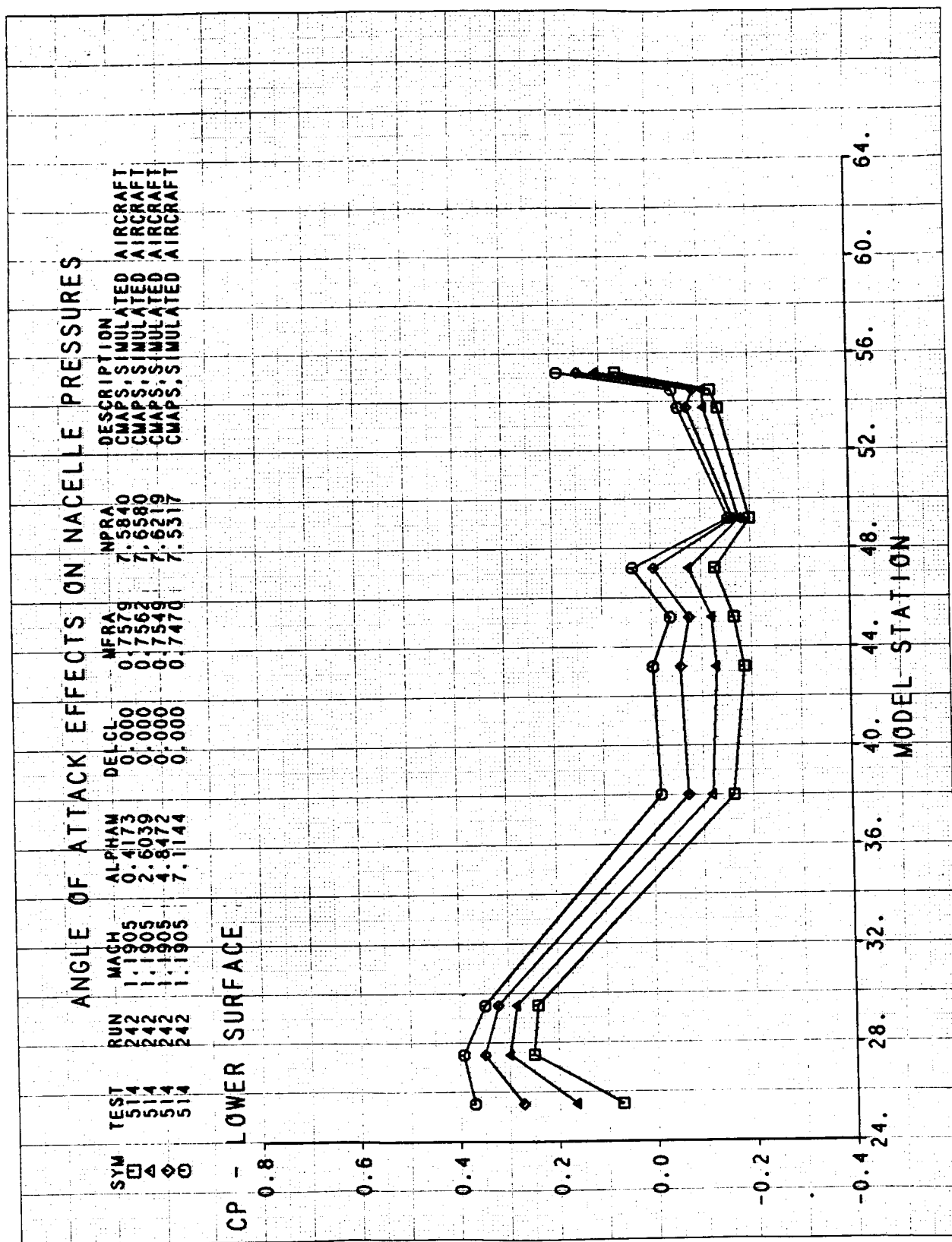


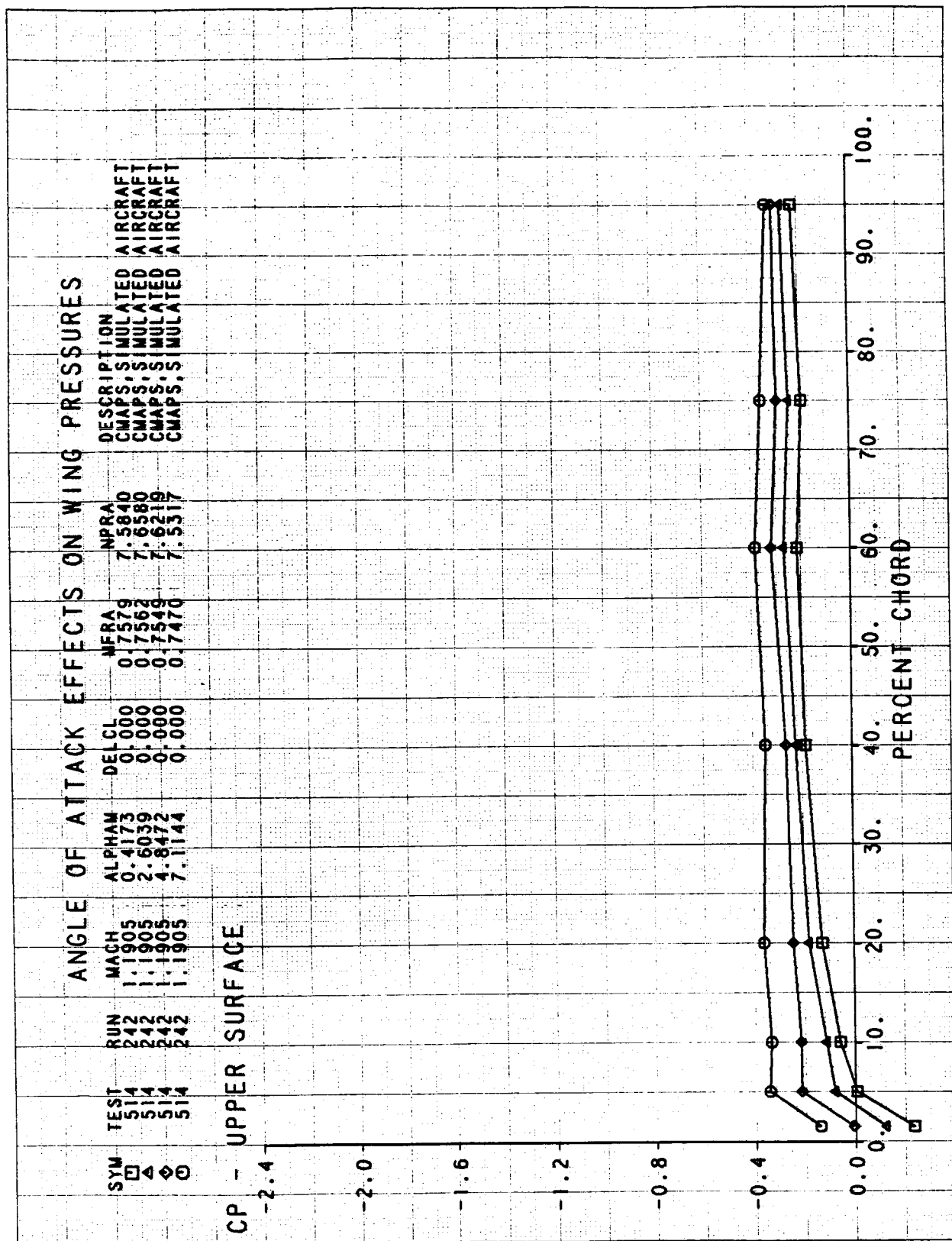




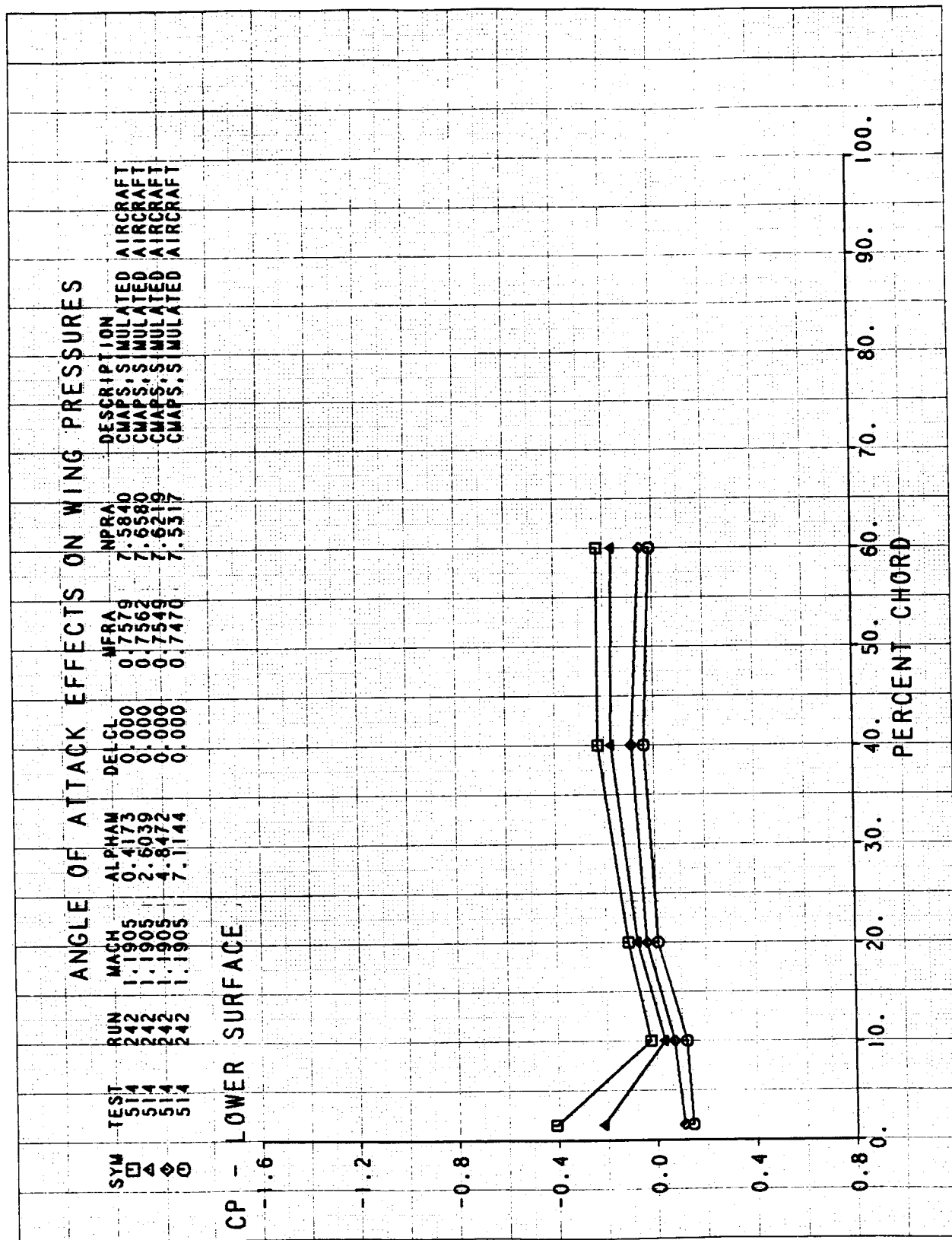


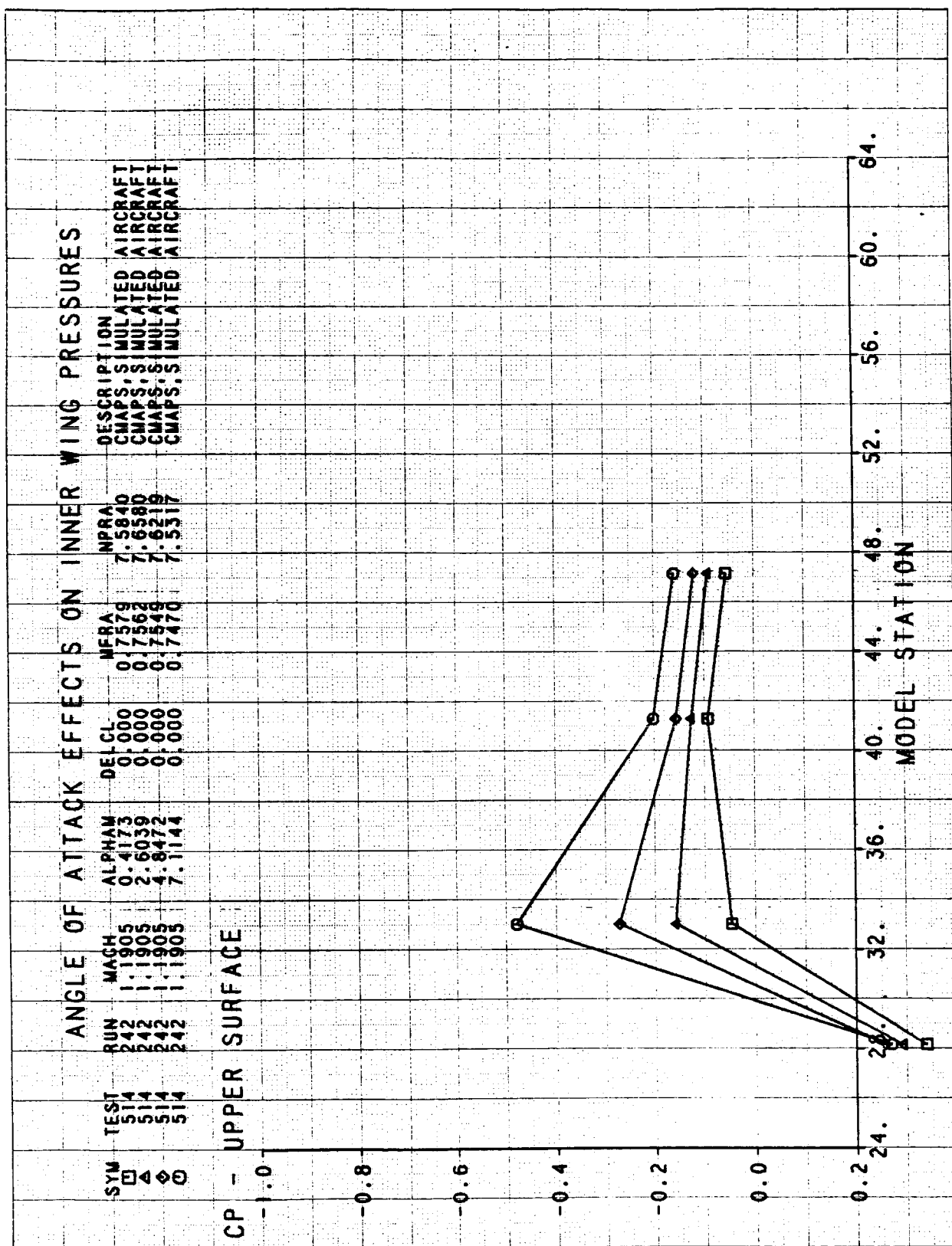


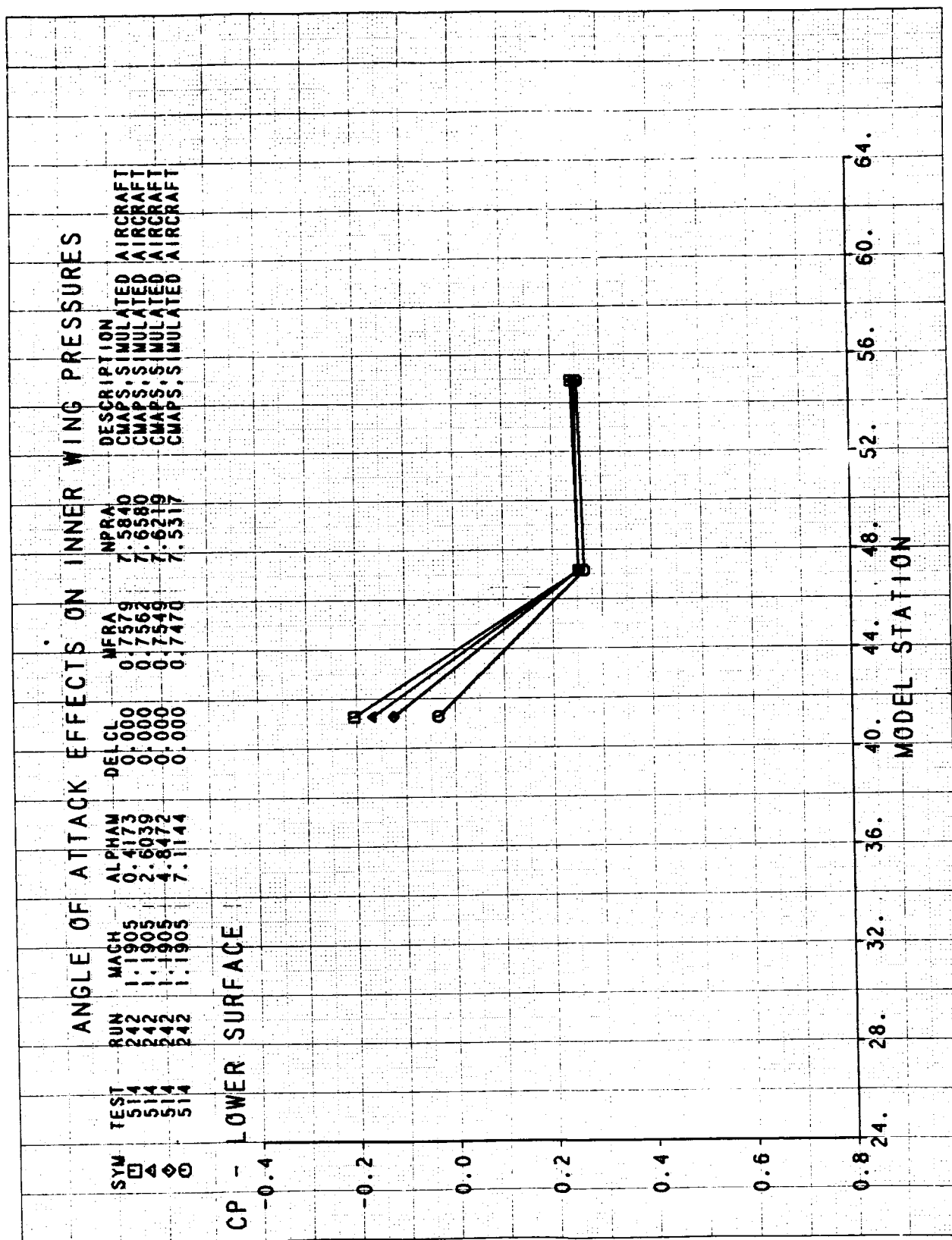


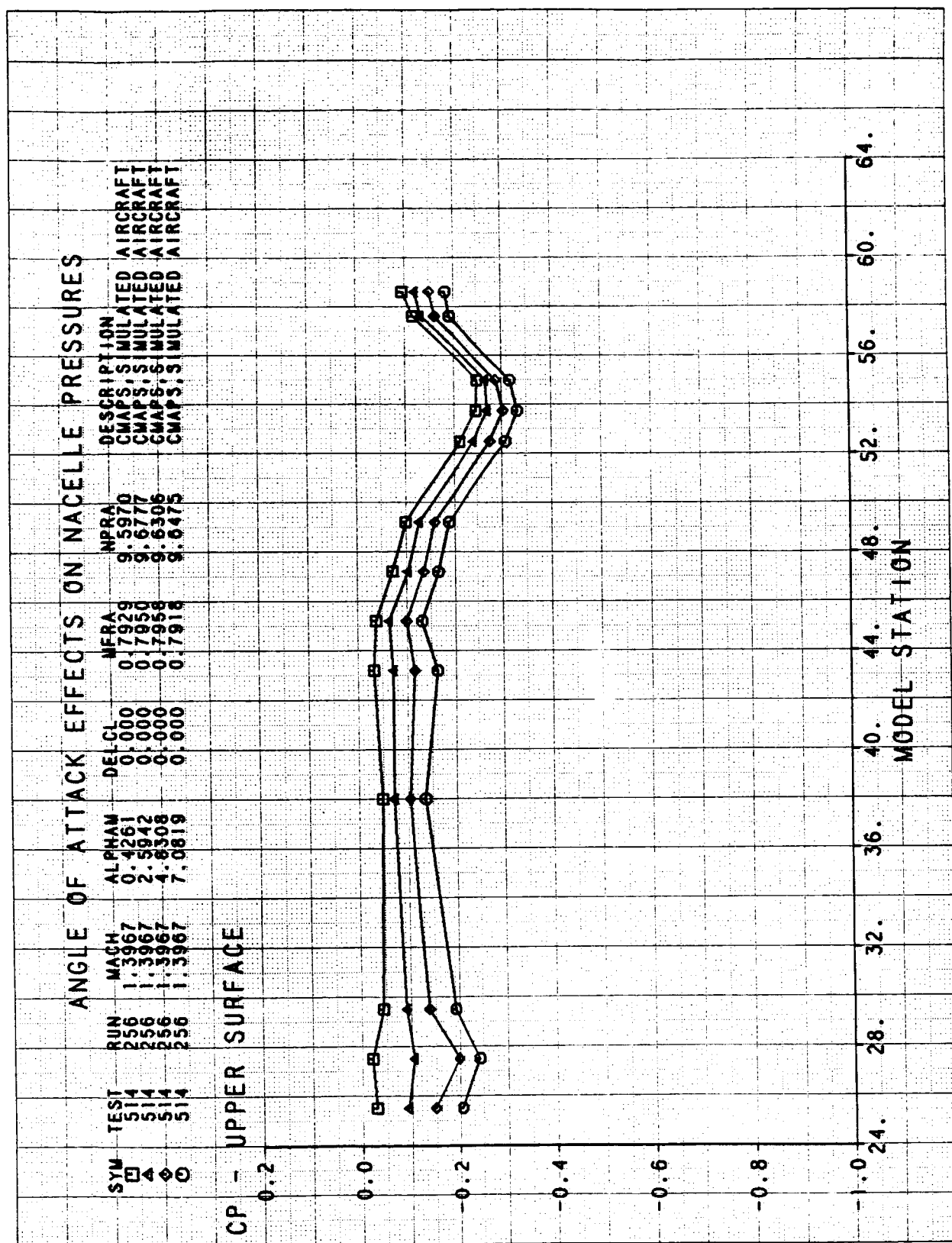


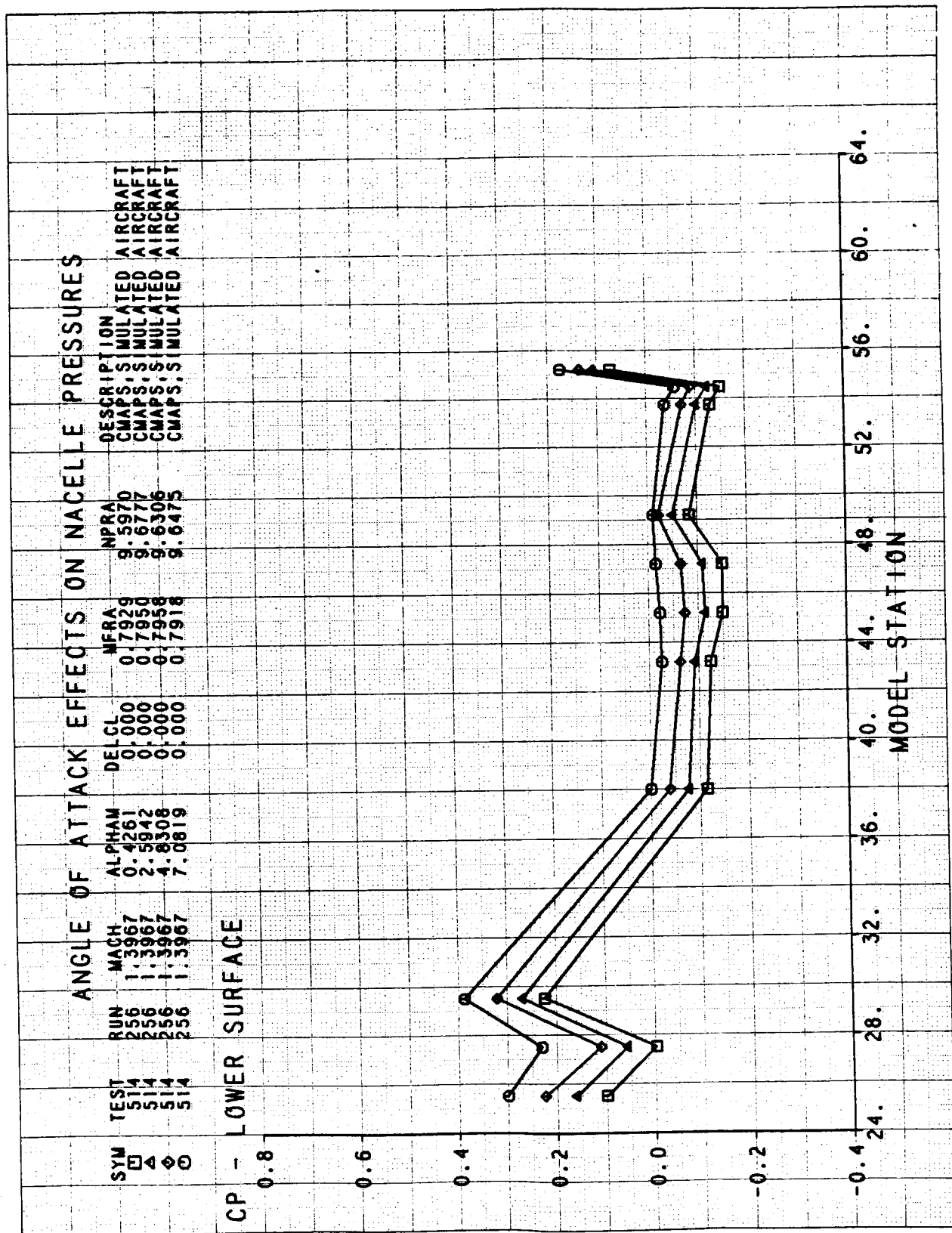


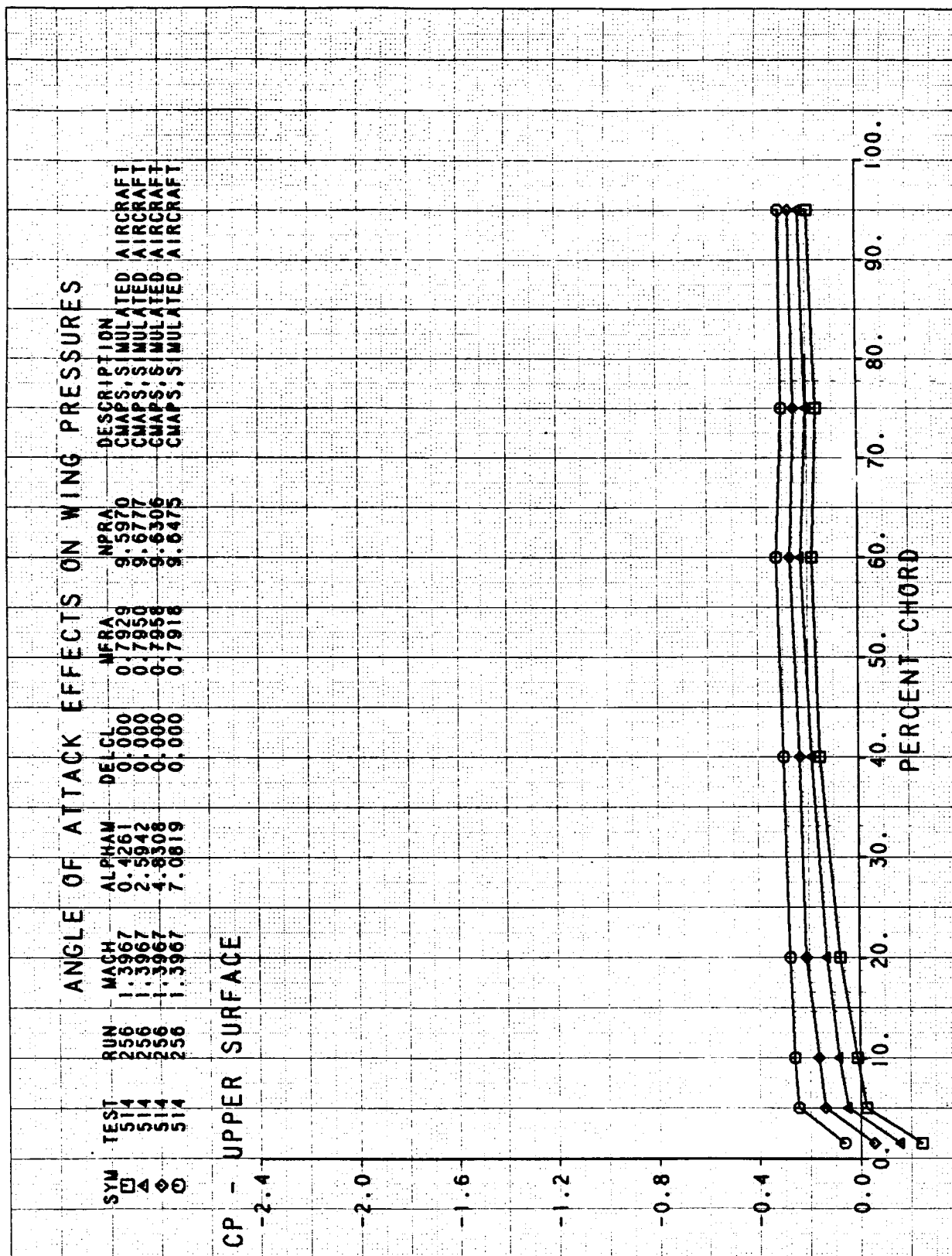


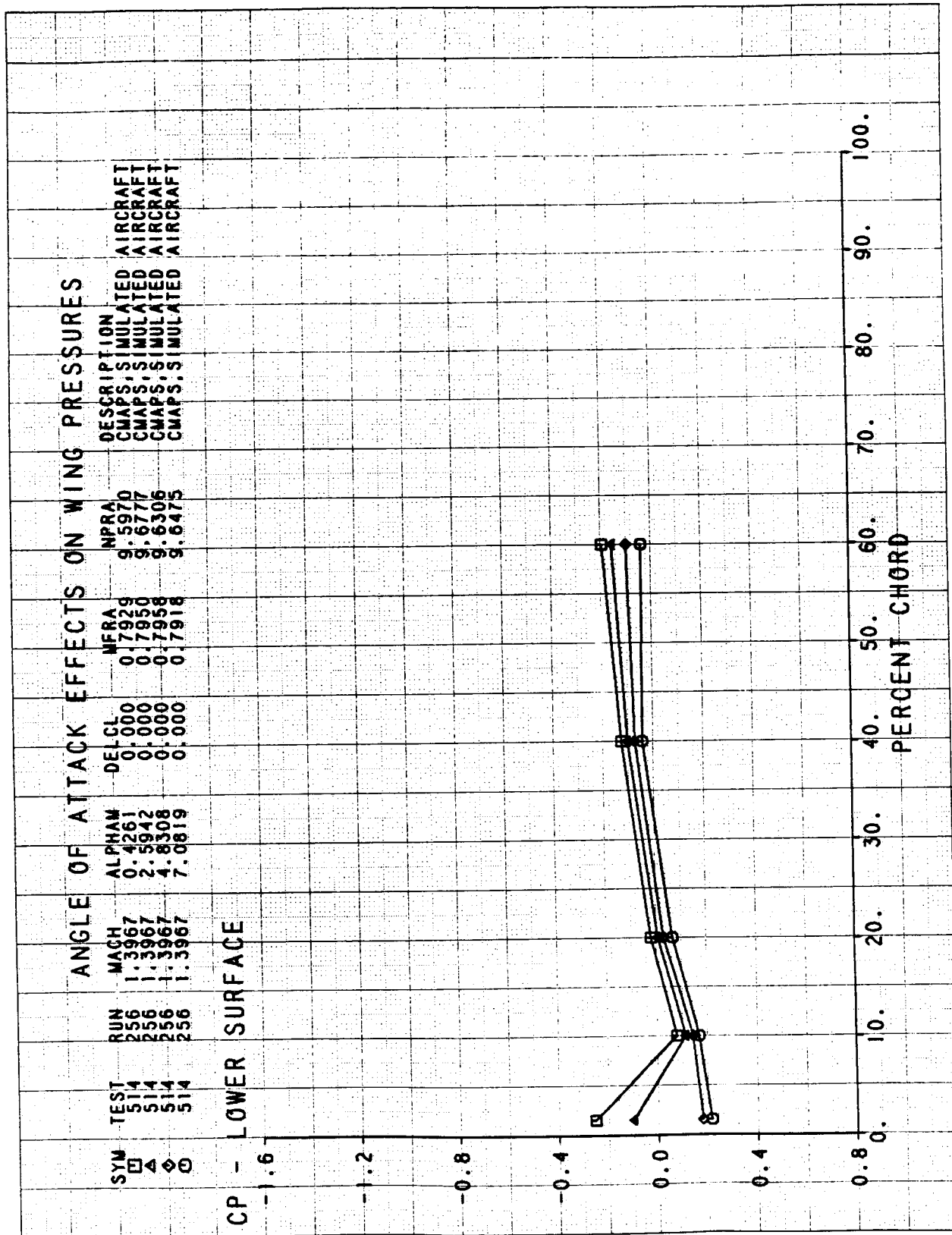


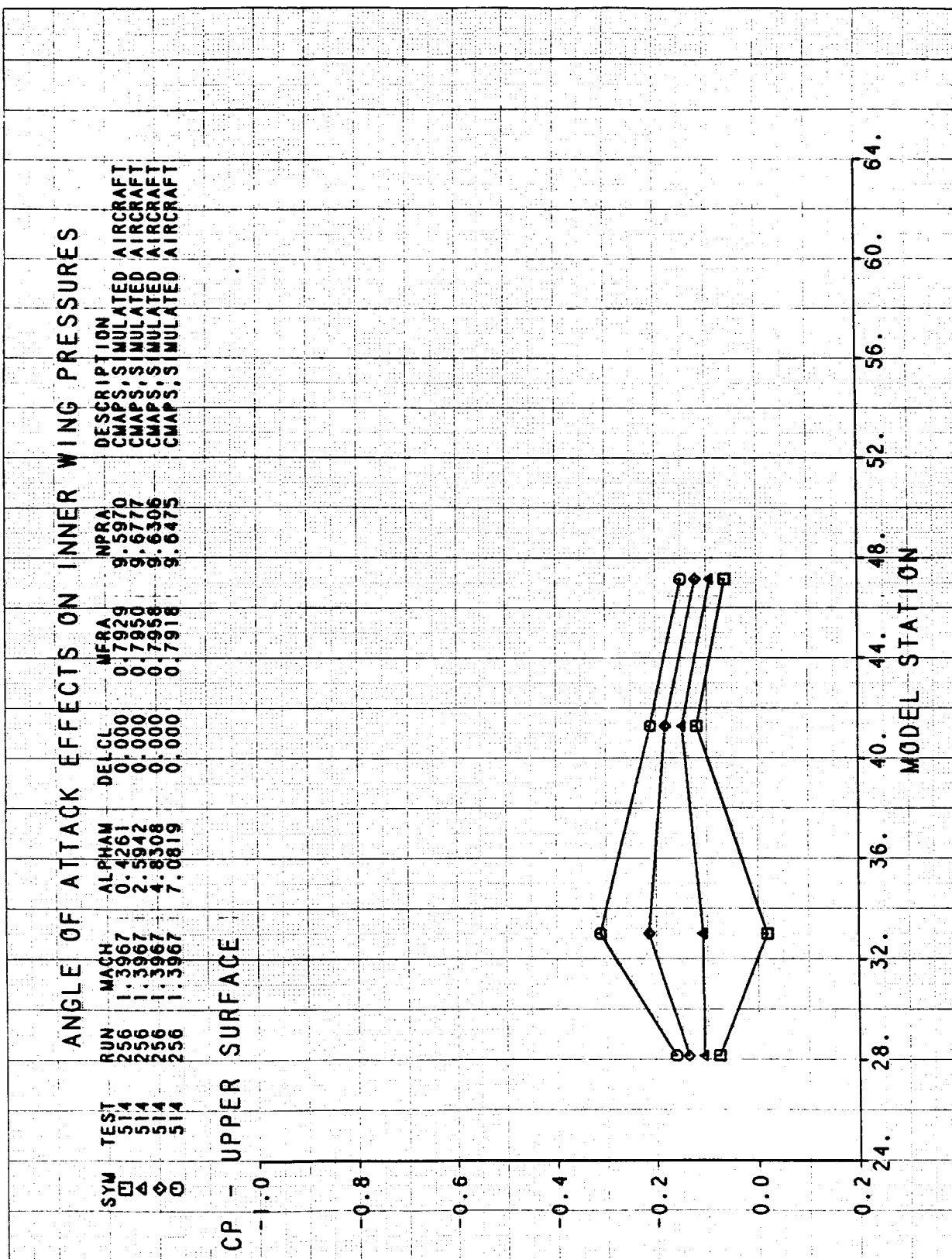




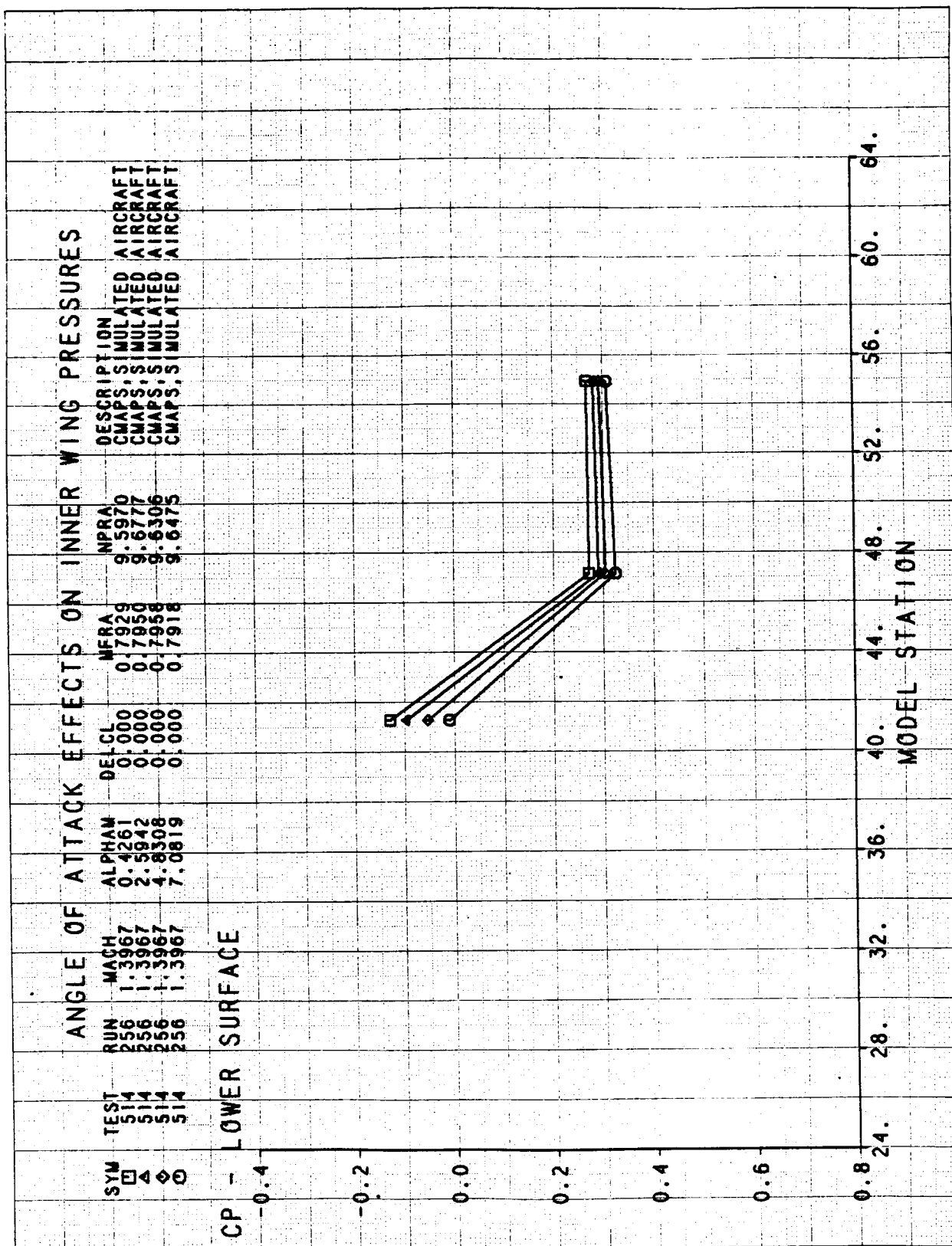


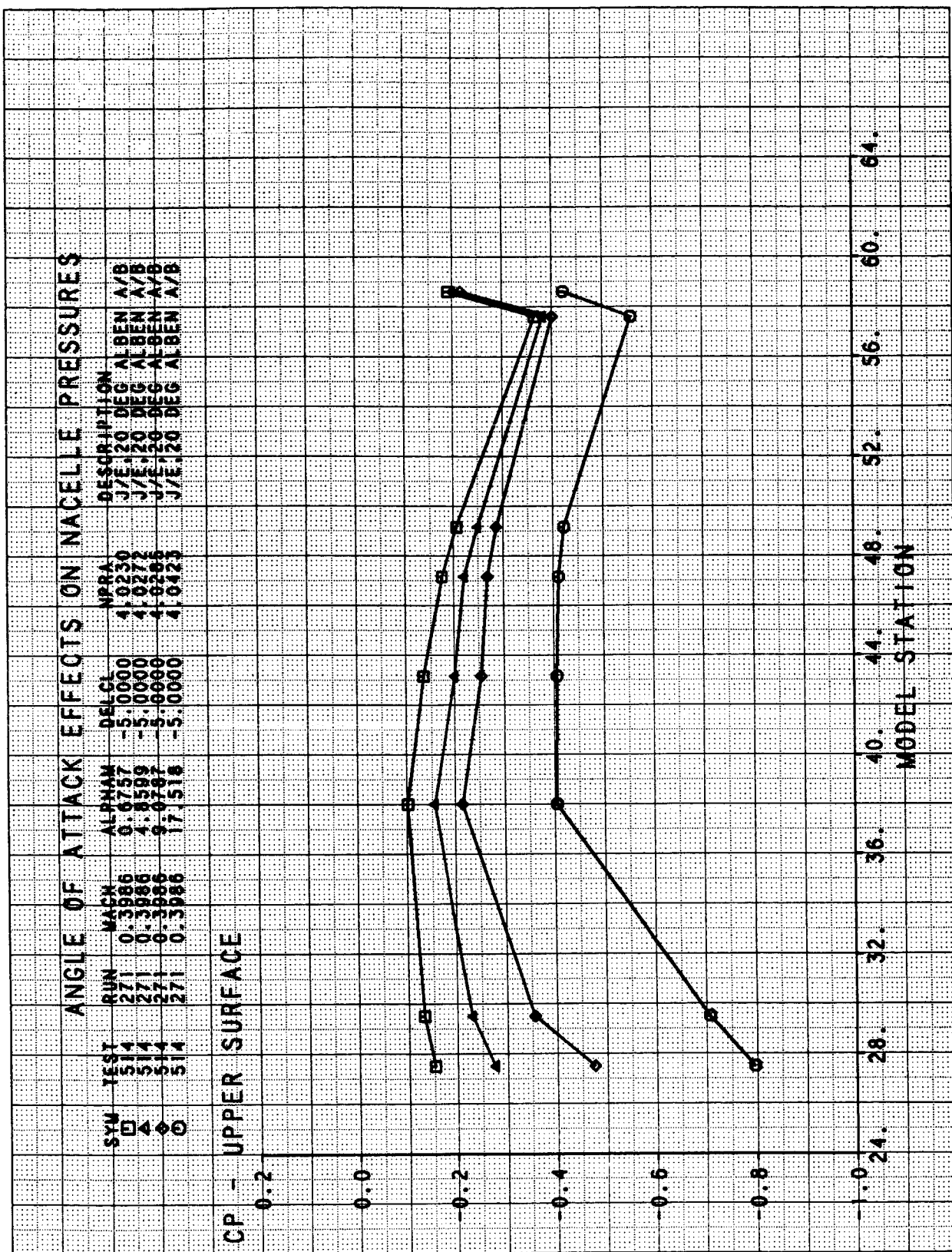


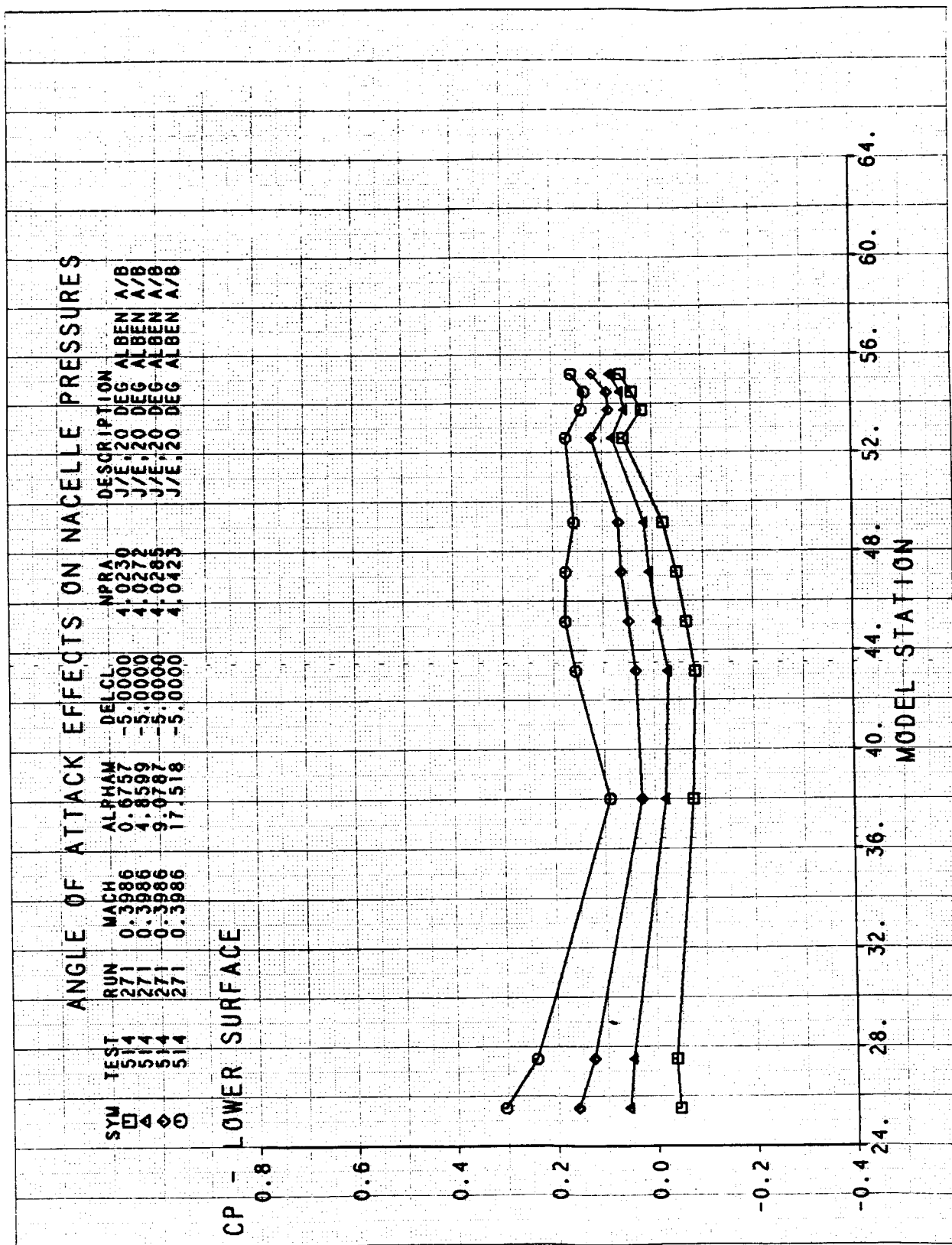




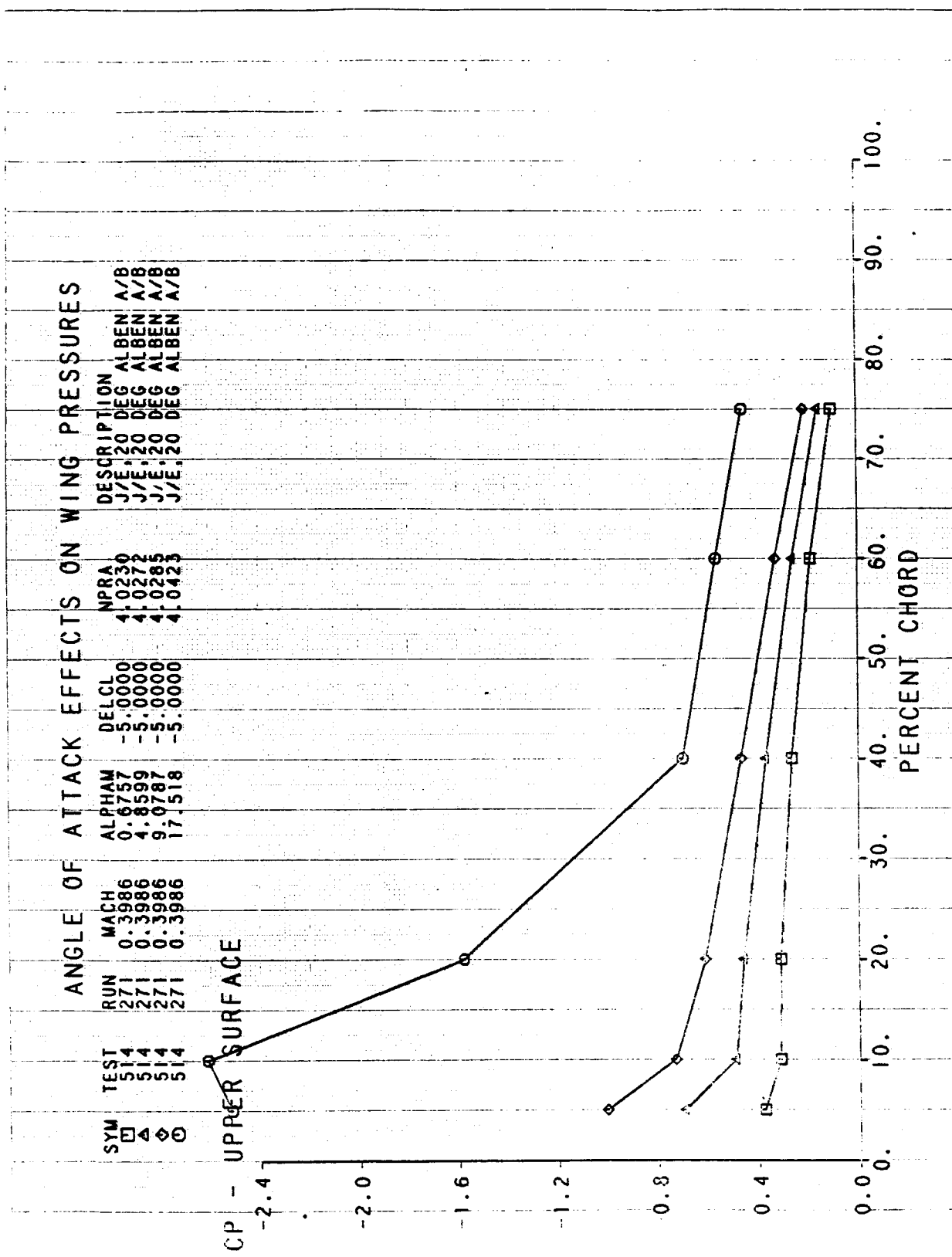


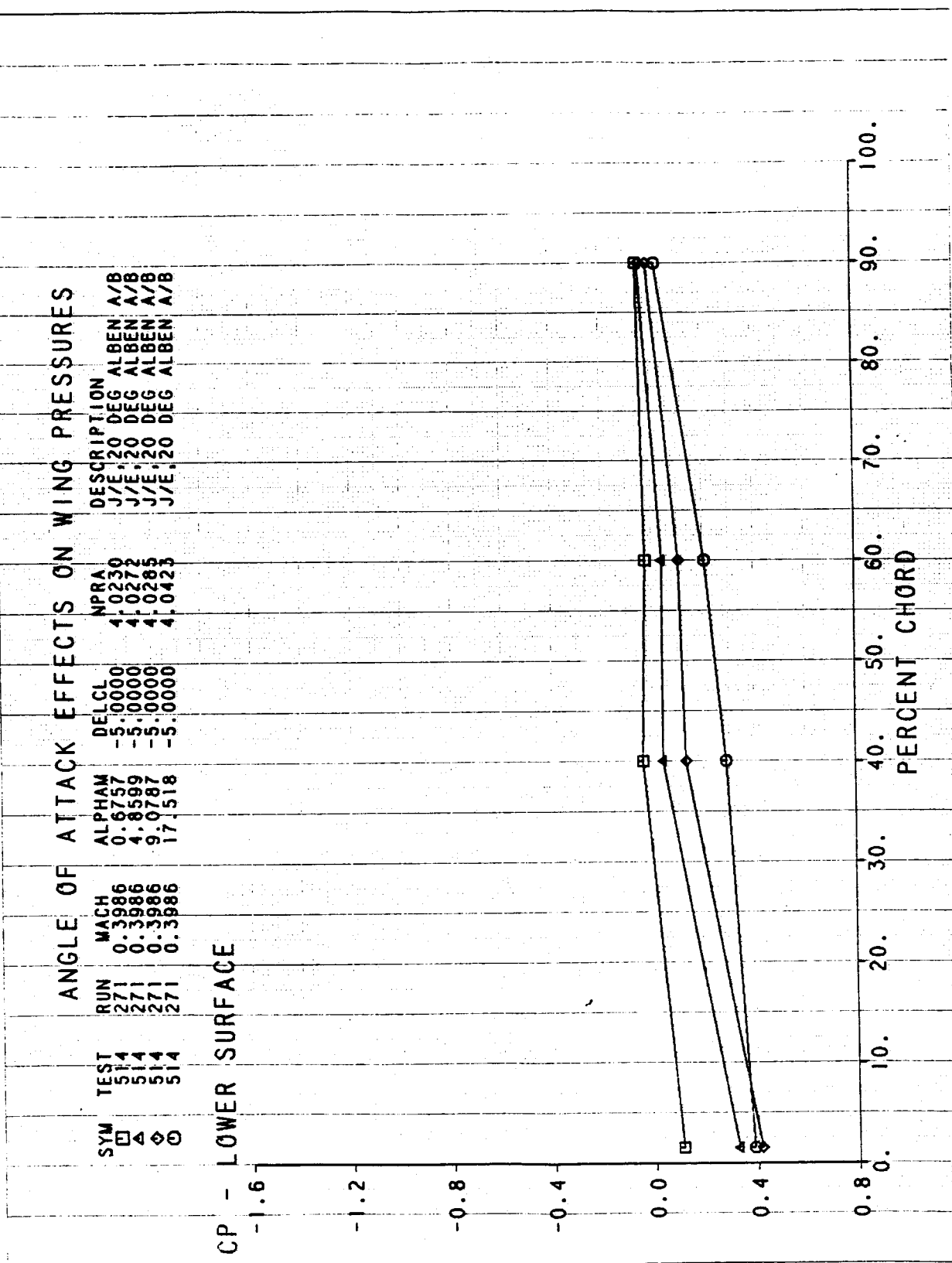






ORIGINAL PAGE IS  
OF POOR QUALITY

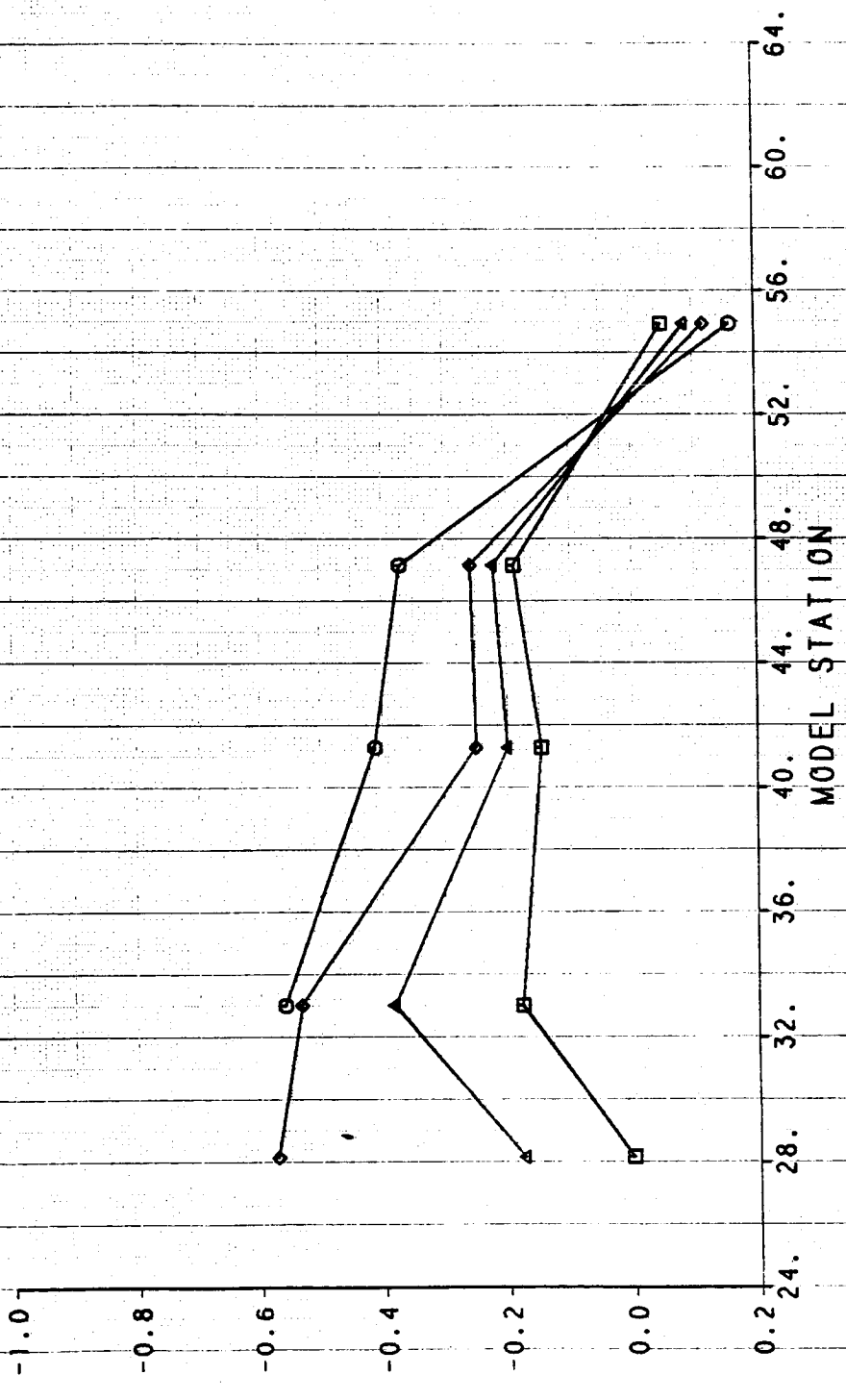


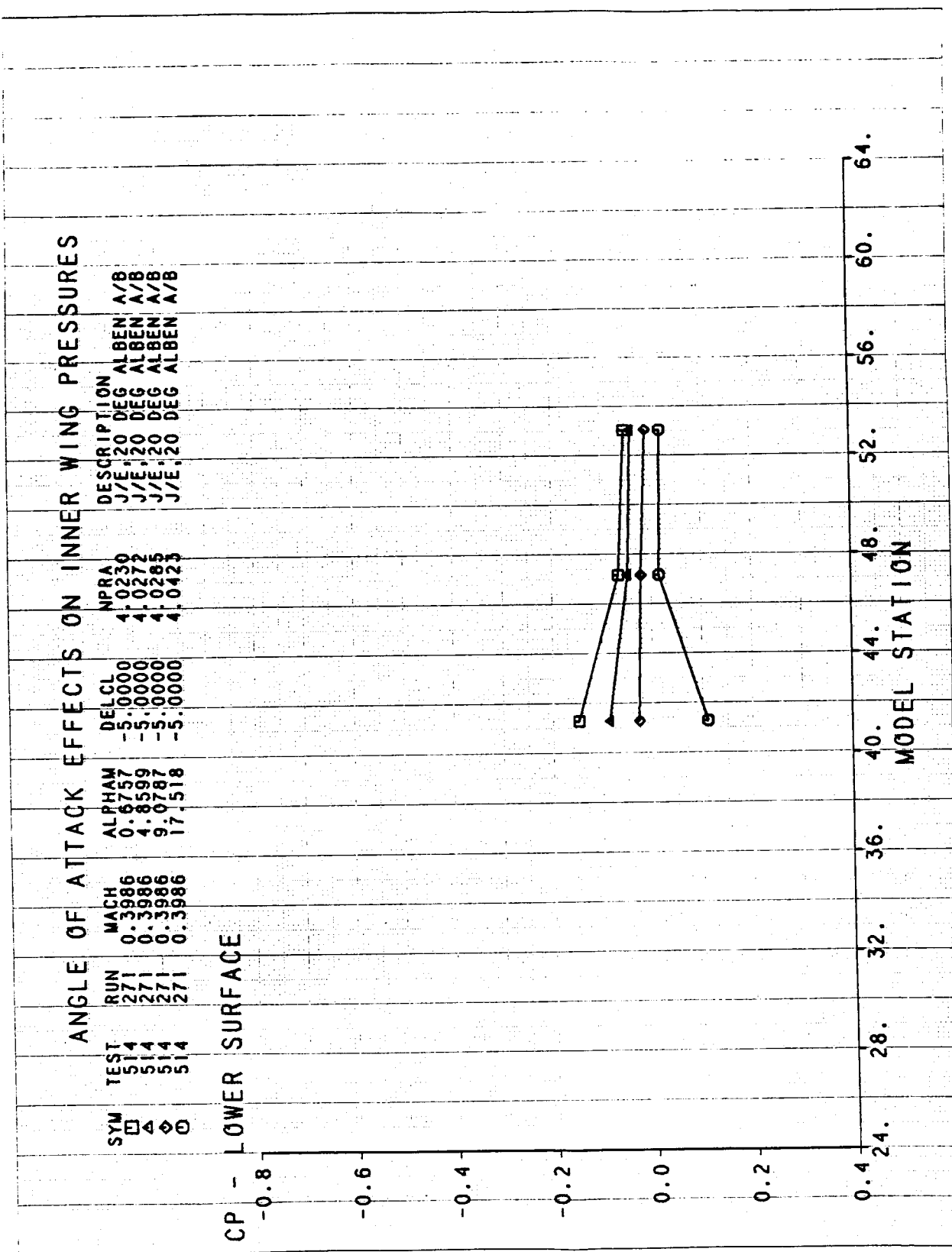


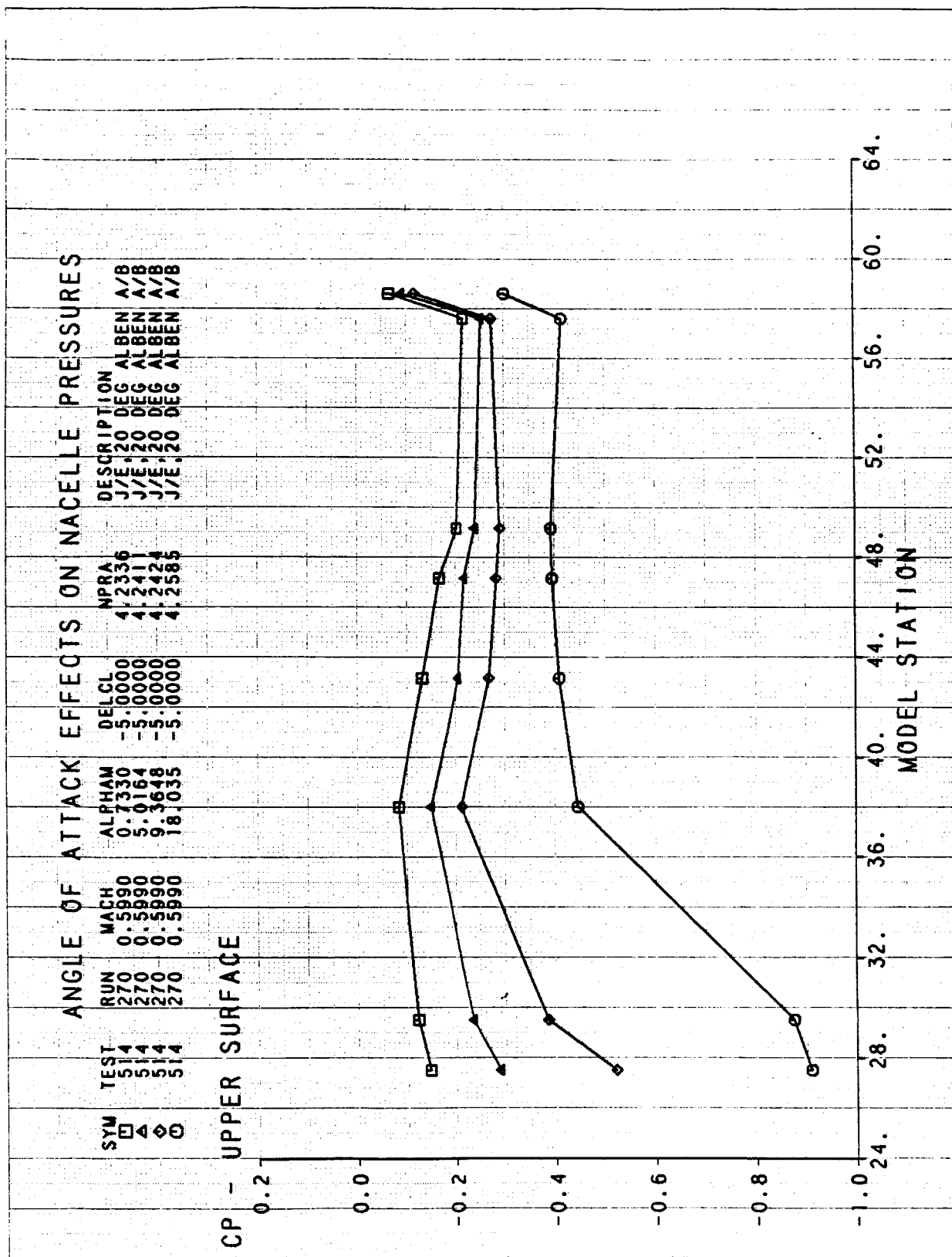
# ANGLE OF ATTACK EFFECTS ON INNER WING PRESSURES

SYM	TEST	RUN	MACH	ALPHA	DELCL	NPRA	DESCRIPTION
□	514	271	0.3986	0.6757	-5.0000	4.0230	J/E.120 DEG ALBEN A/B
△	514	271	0.3986	4.8599	-5.0000	4.0272	J/E.120 DEG ALBEN A/B
◇	514	271	0.3986	9.0787	-5.0000	4.0285	J/E.120 DEG ALBEN A/B
○	514	271	0.3986	17.518	-5.0000	4.0423	J/E.120 DEG ALBEN A/B

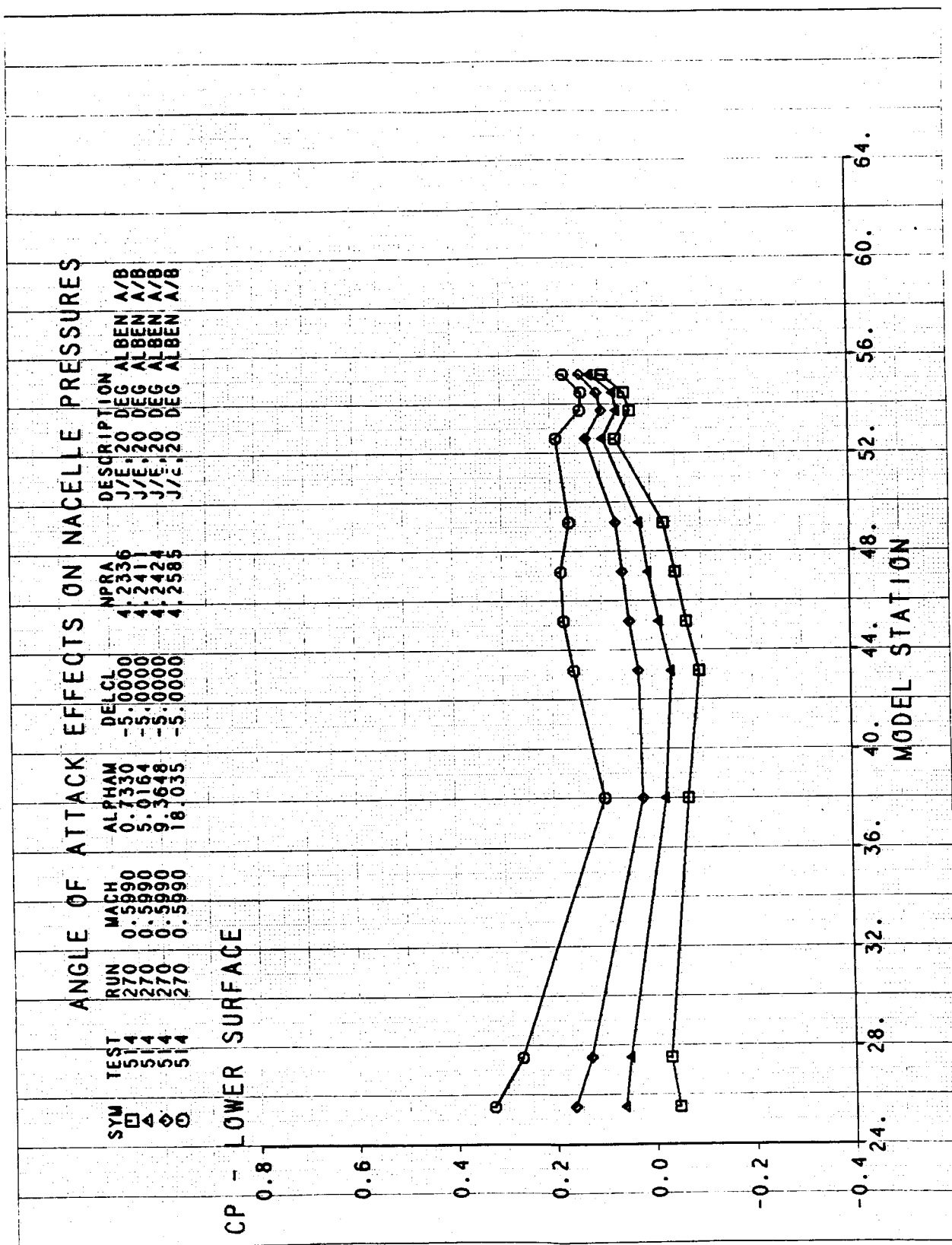
CP - UPPER SURFACE

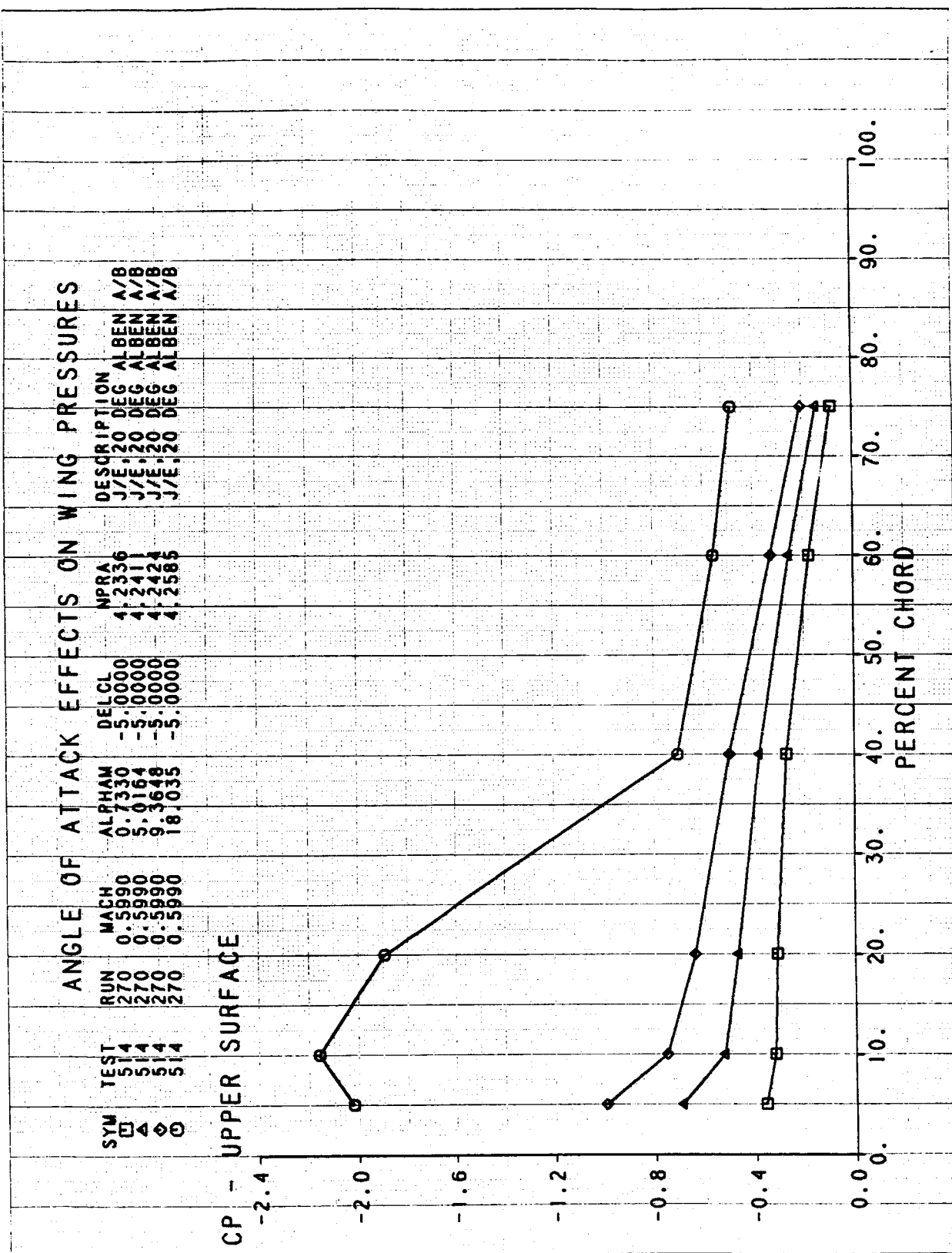


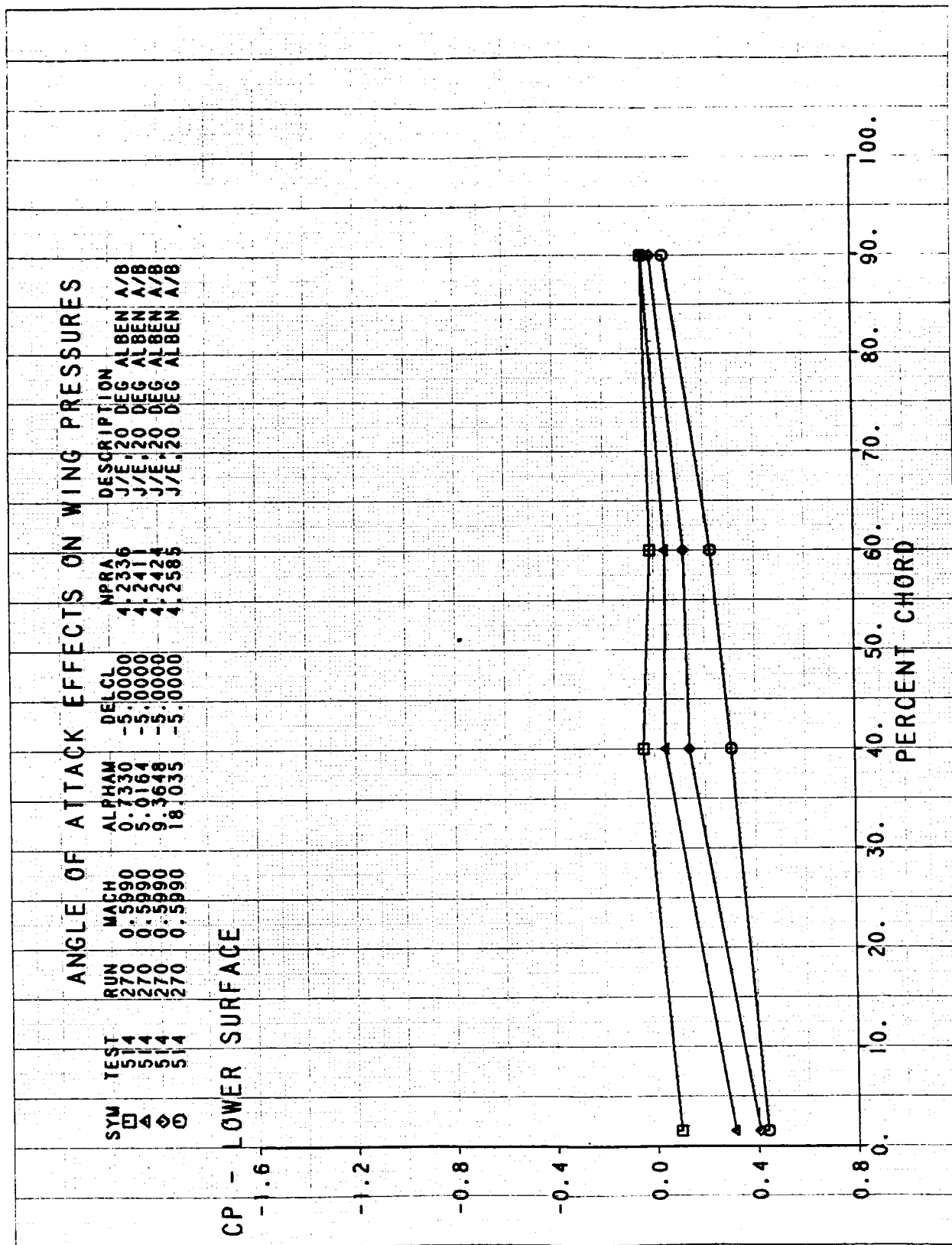


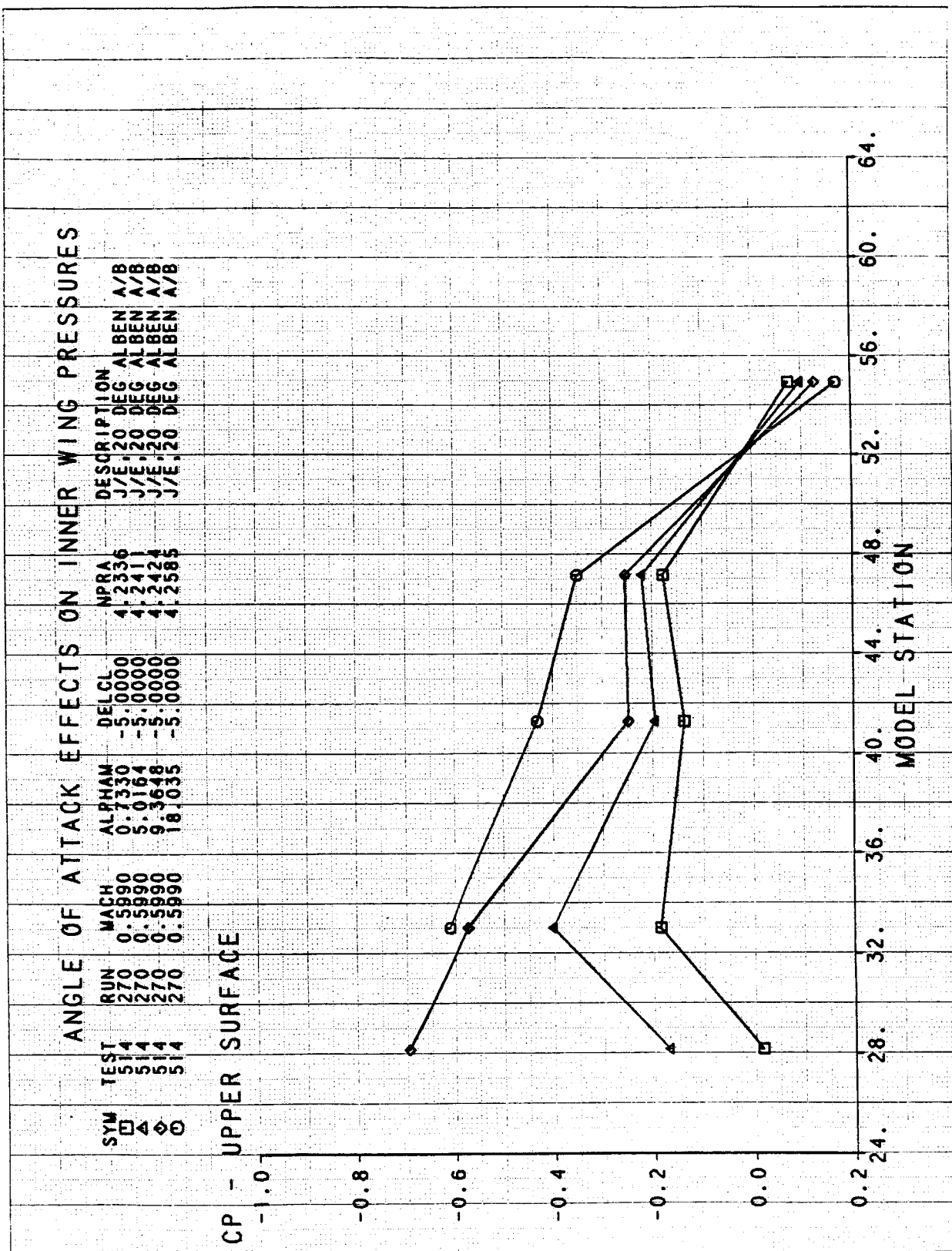


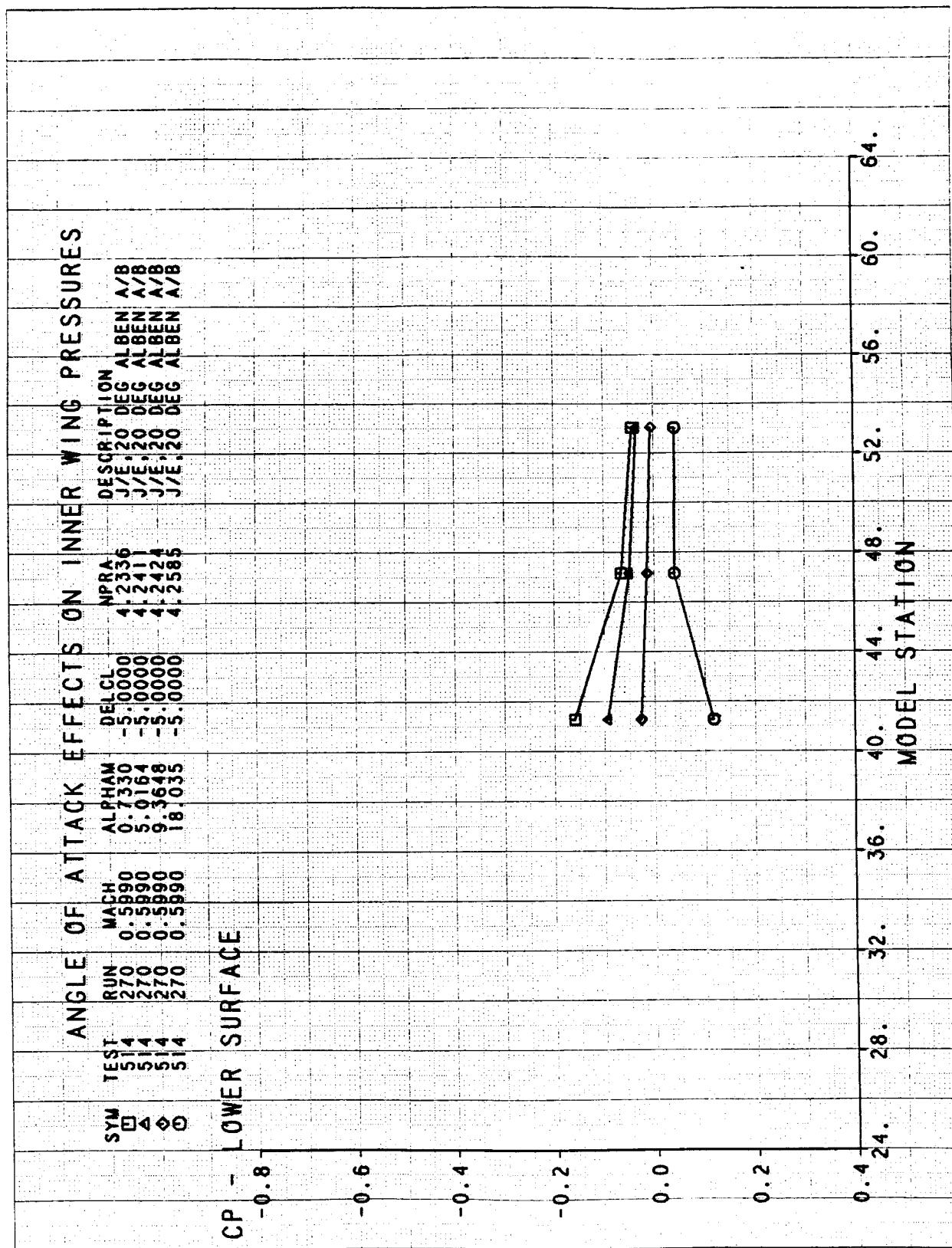


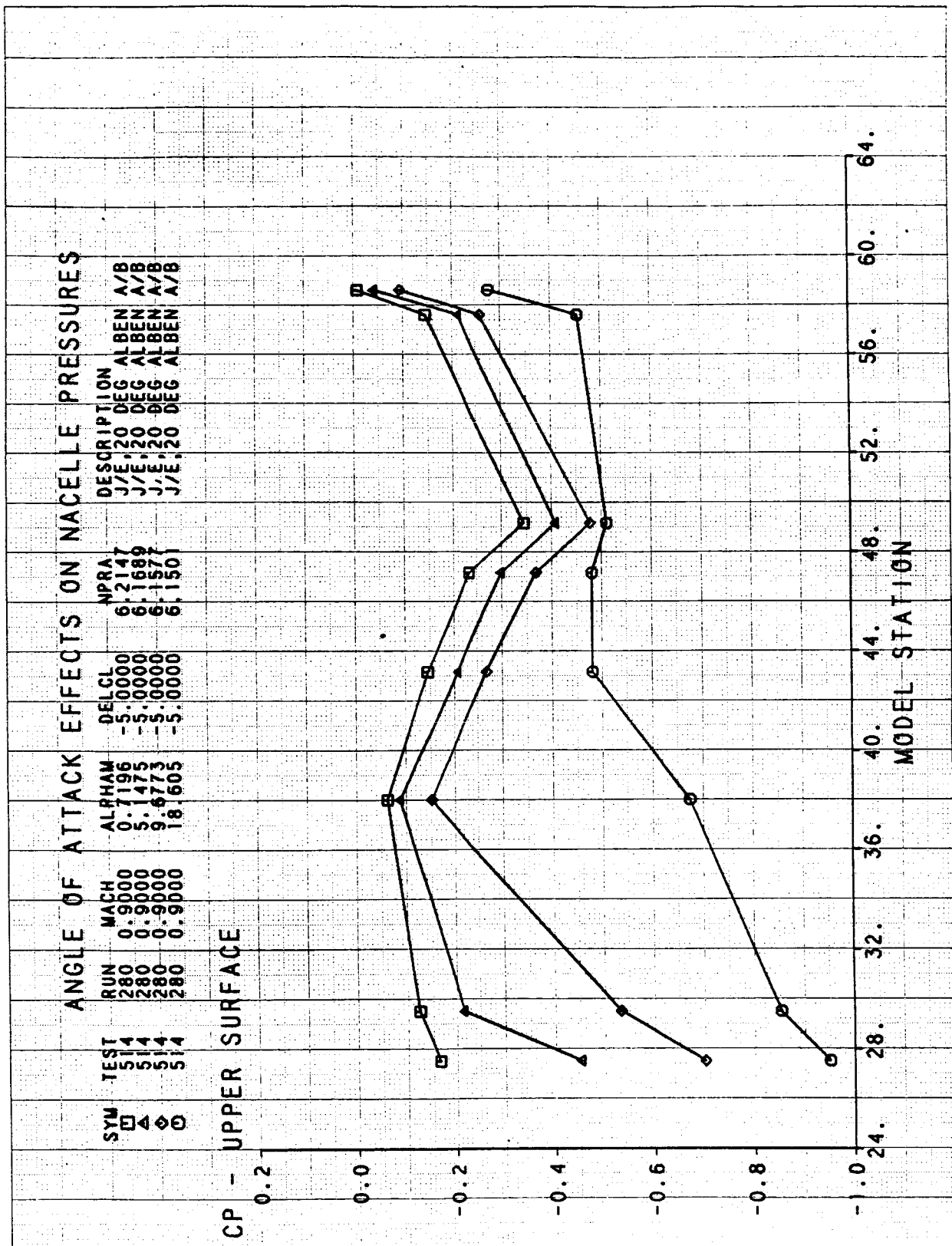


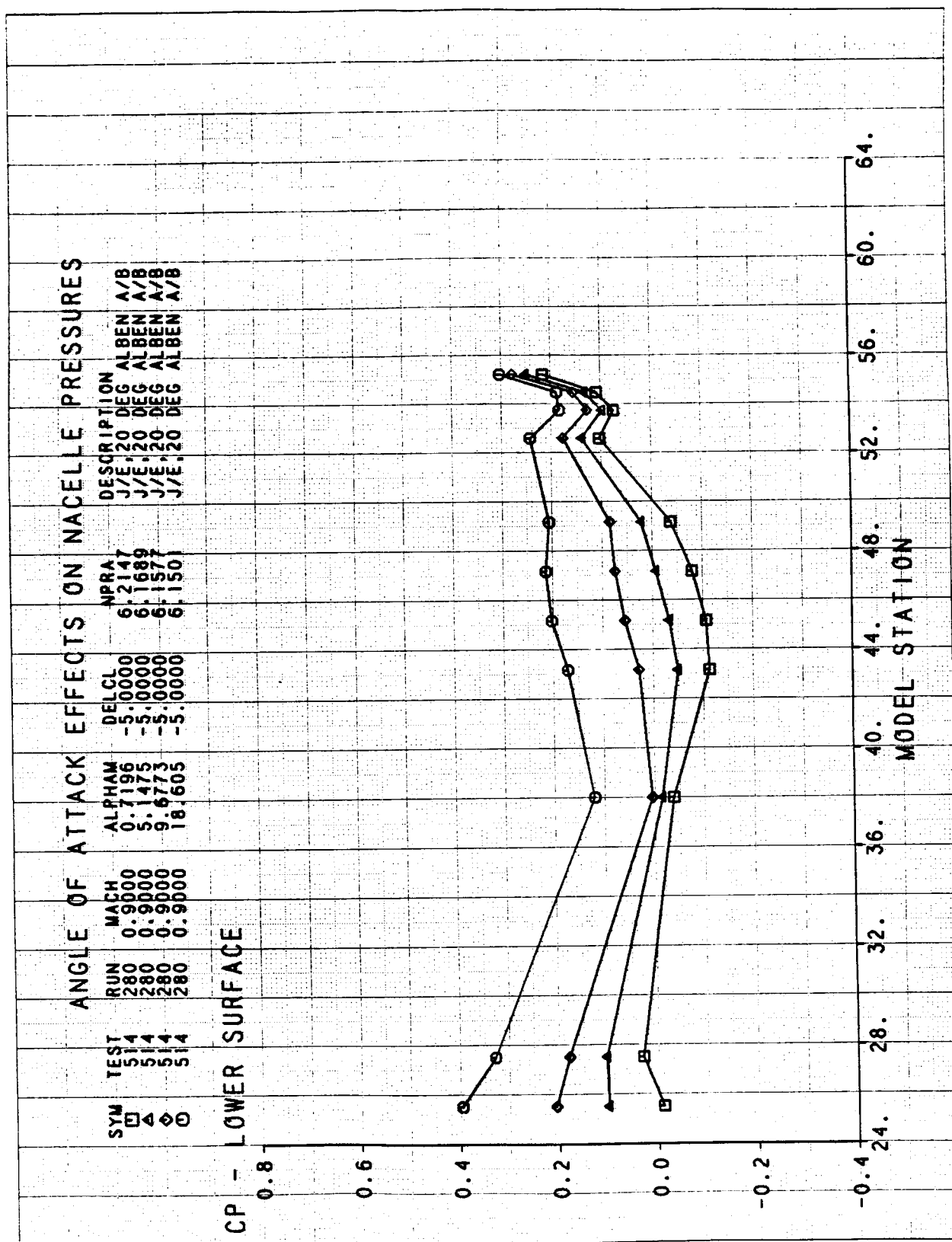


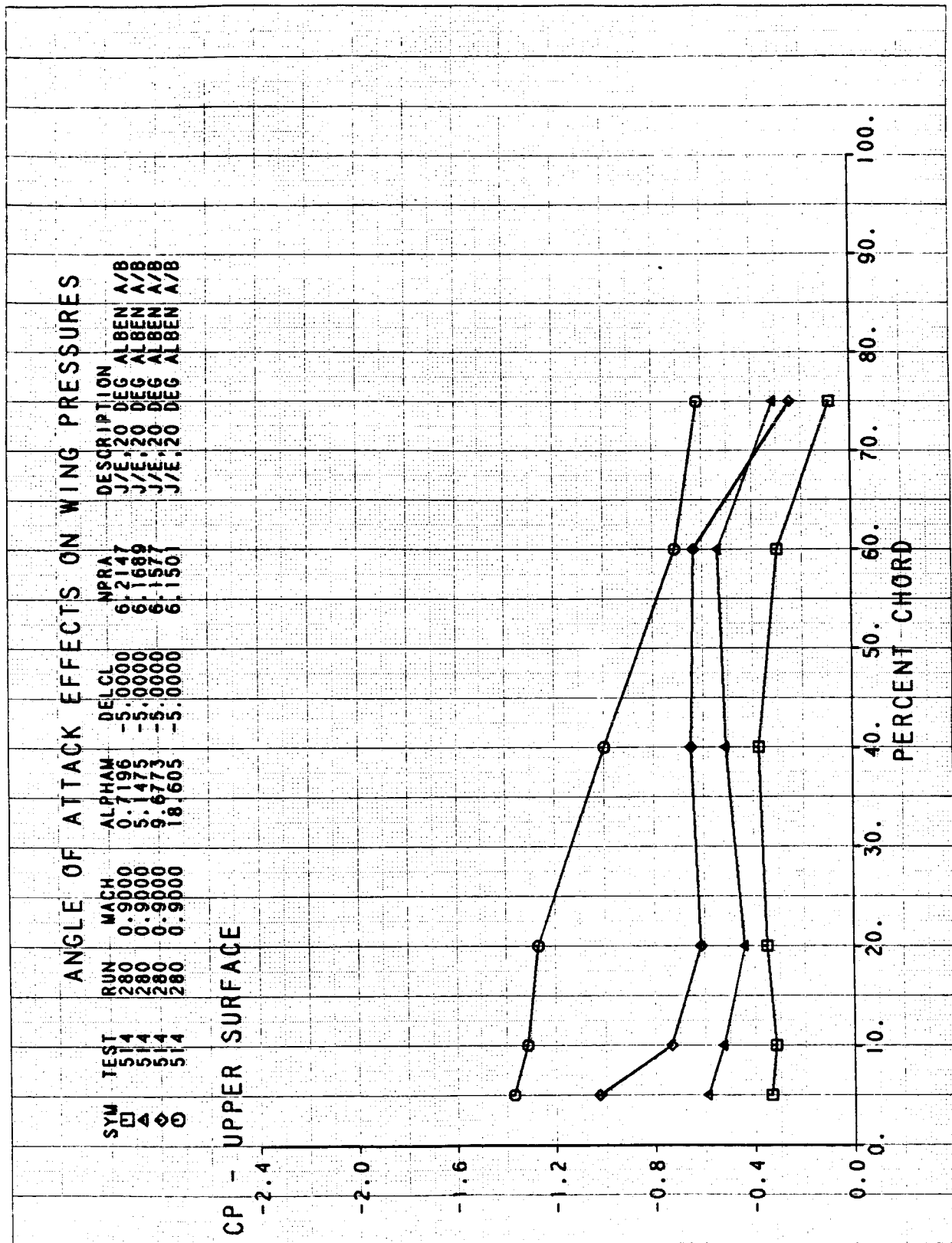




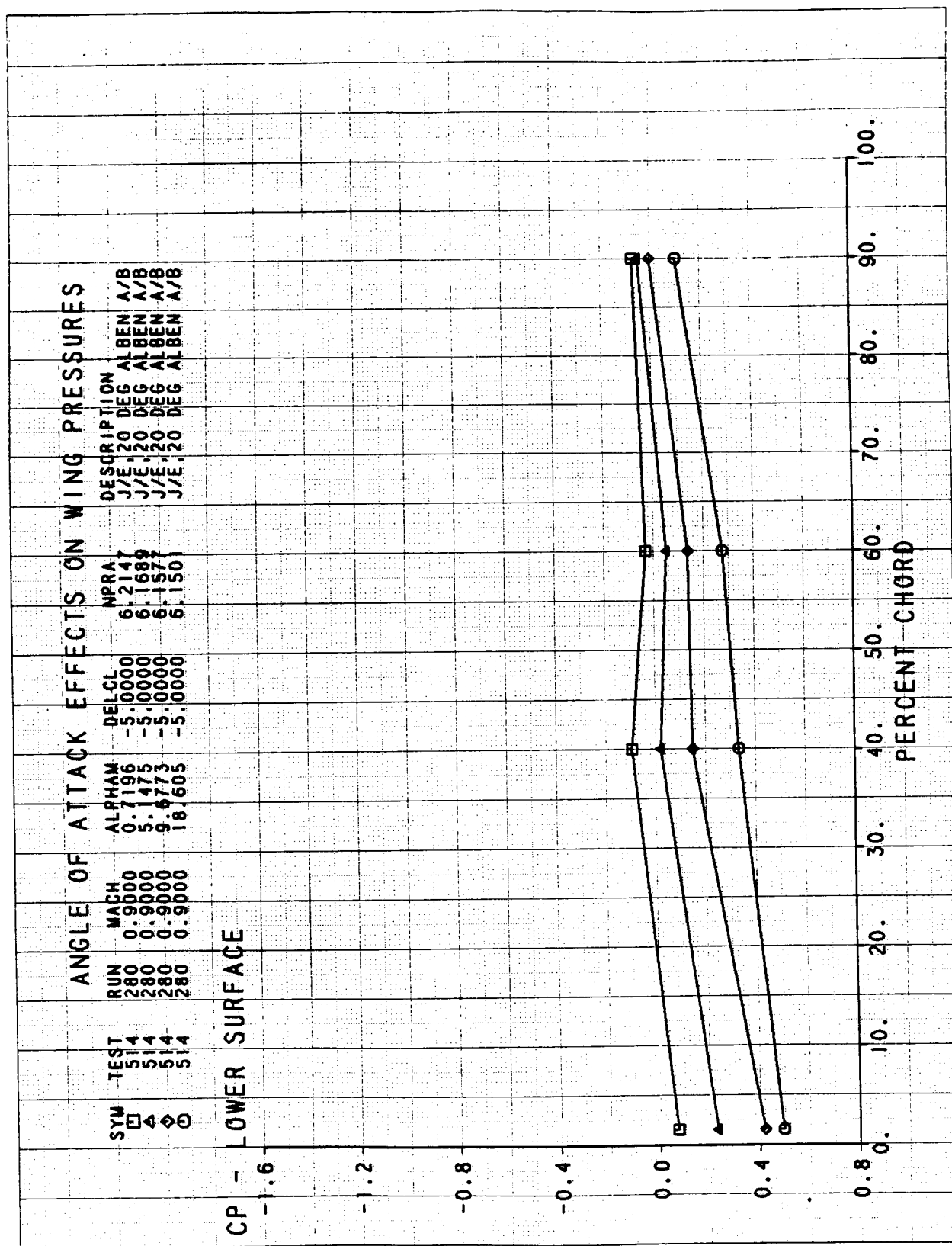


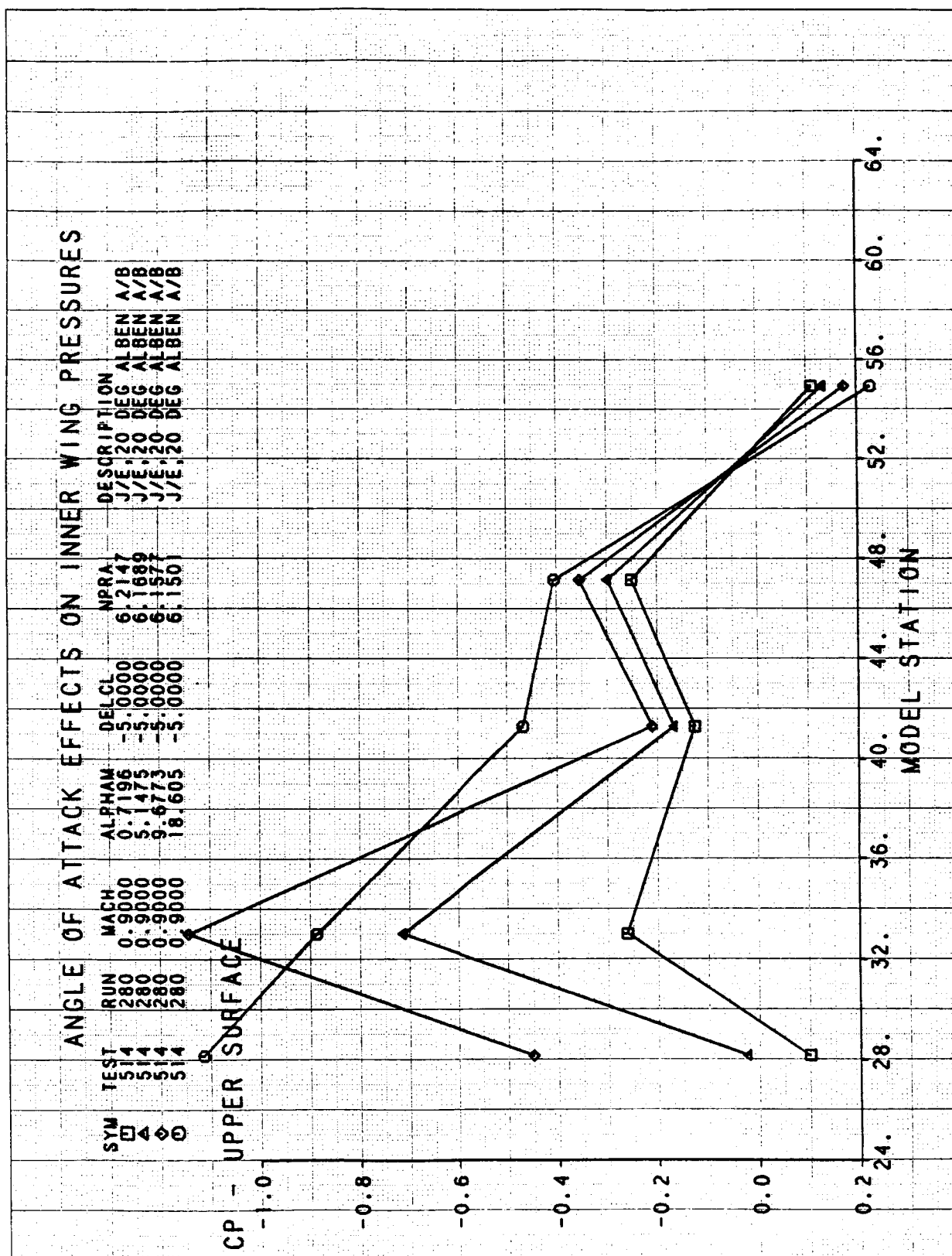


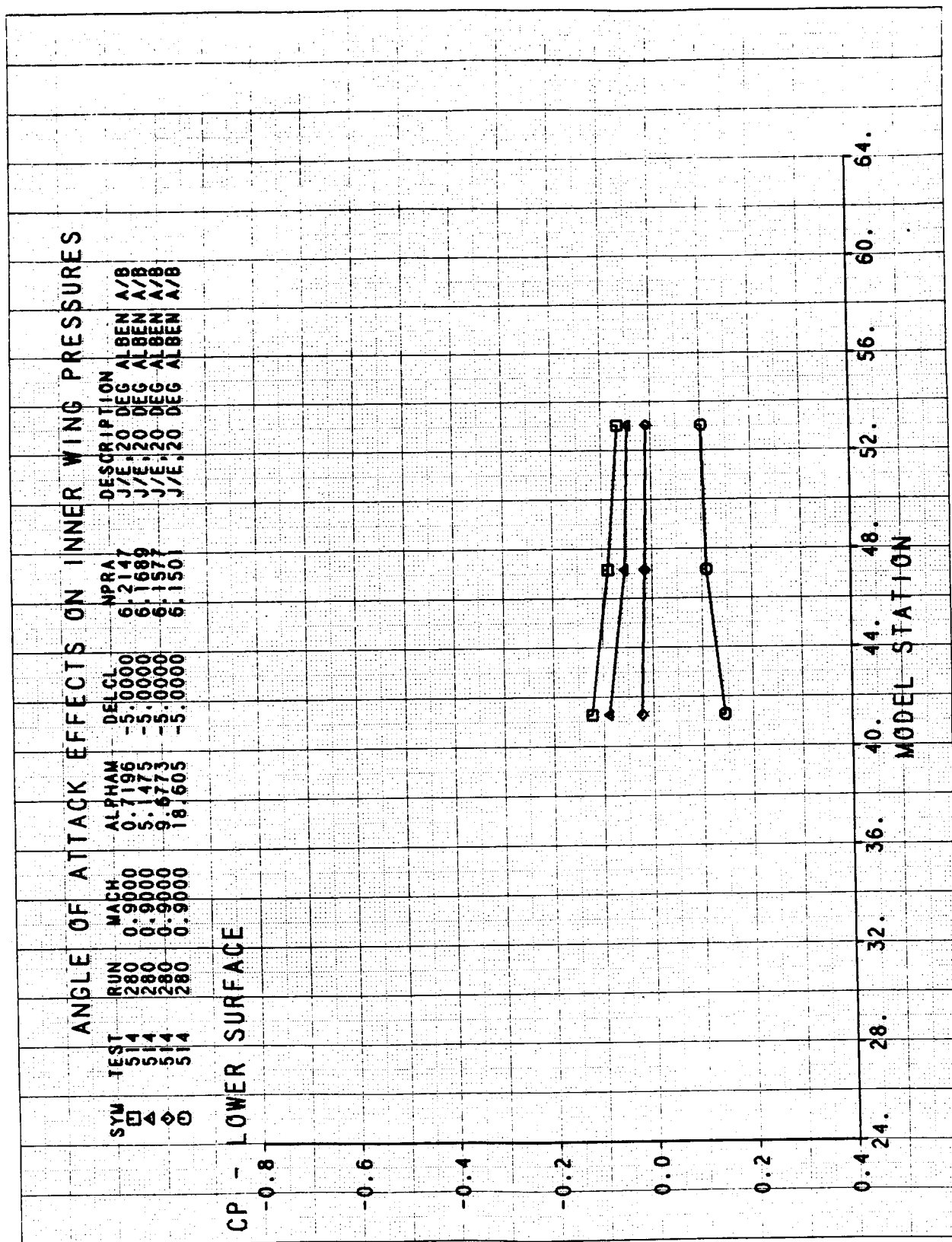


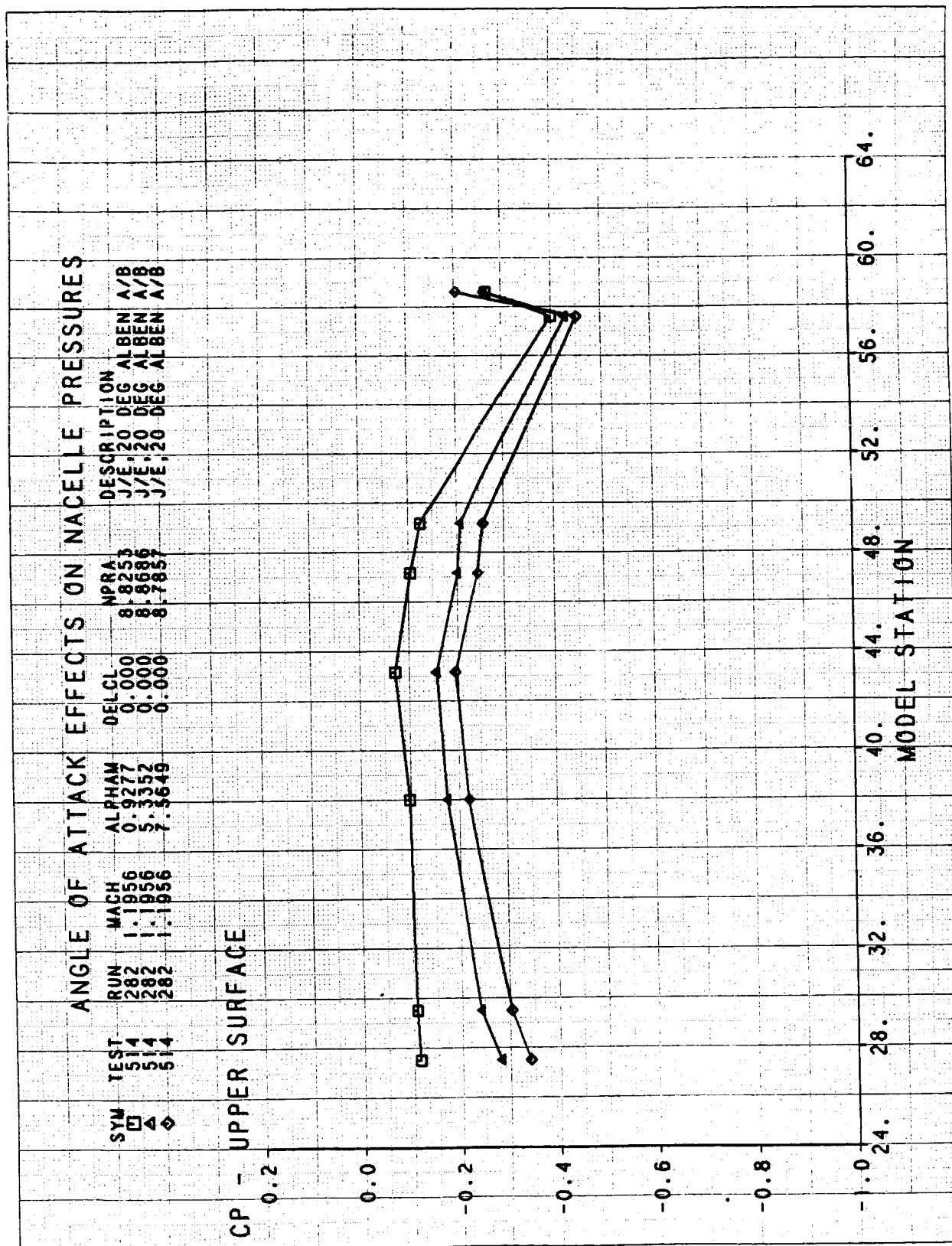


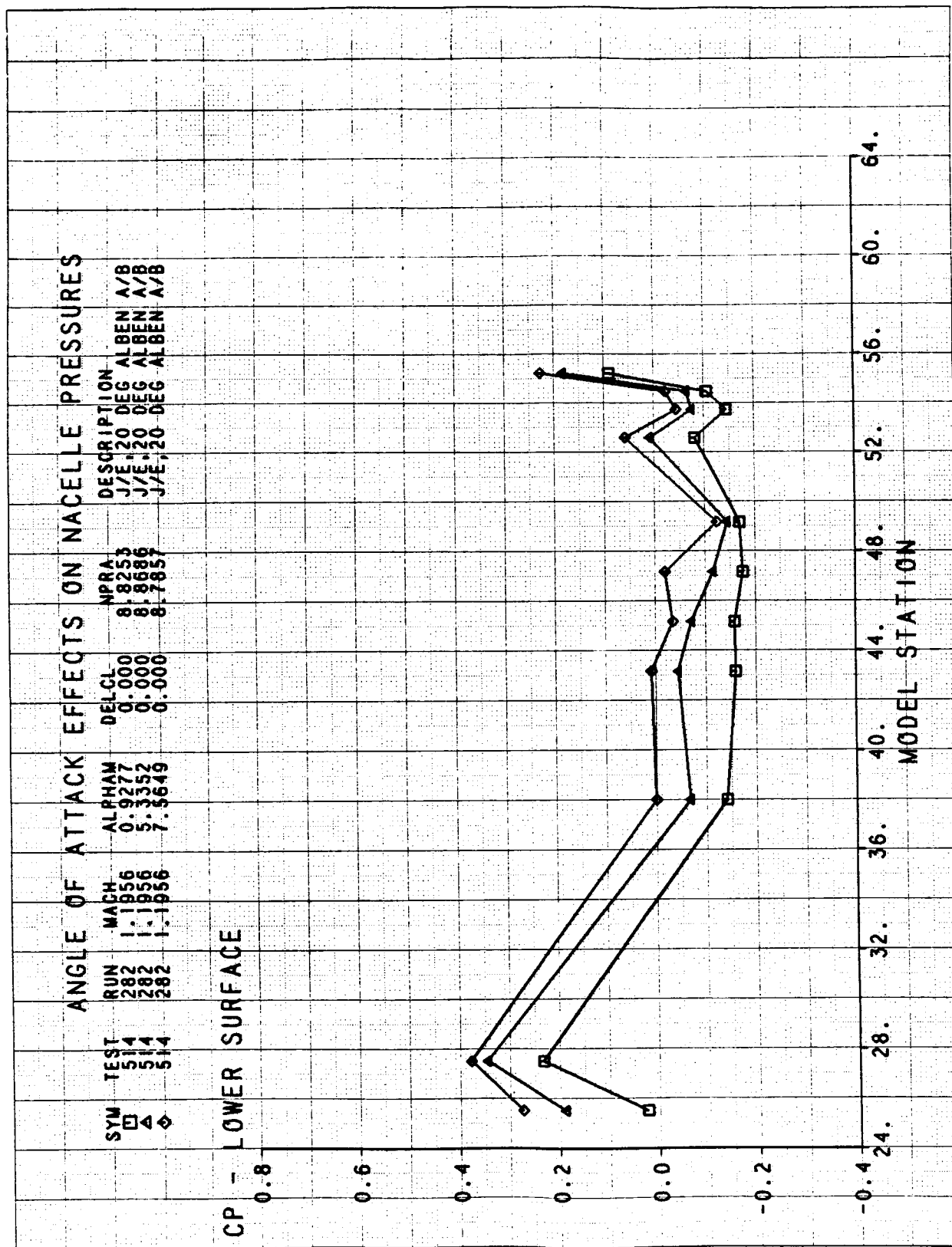


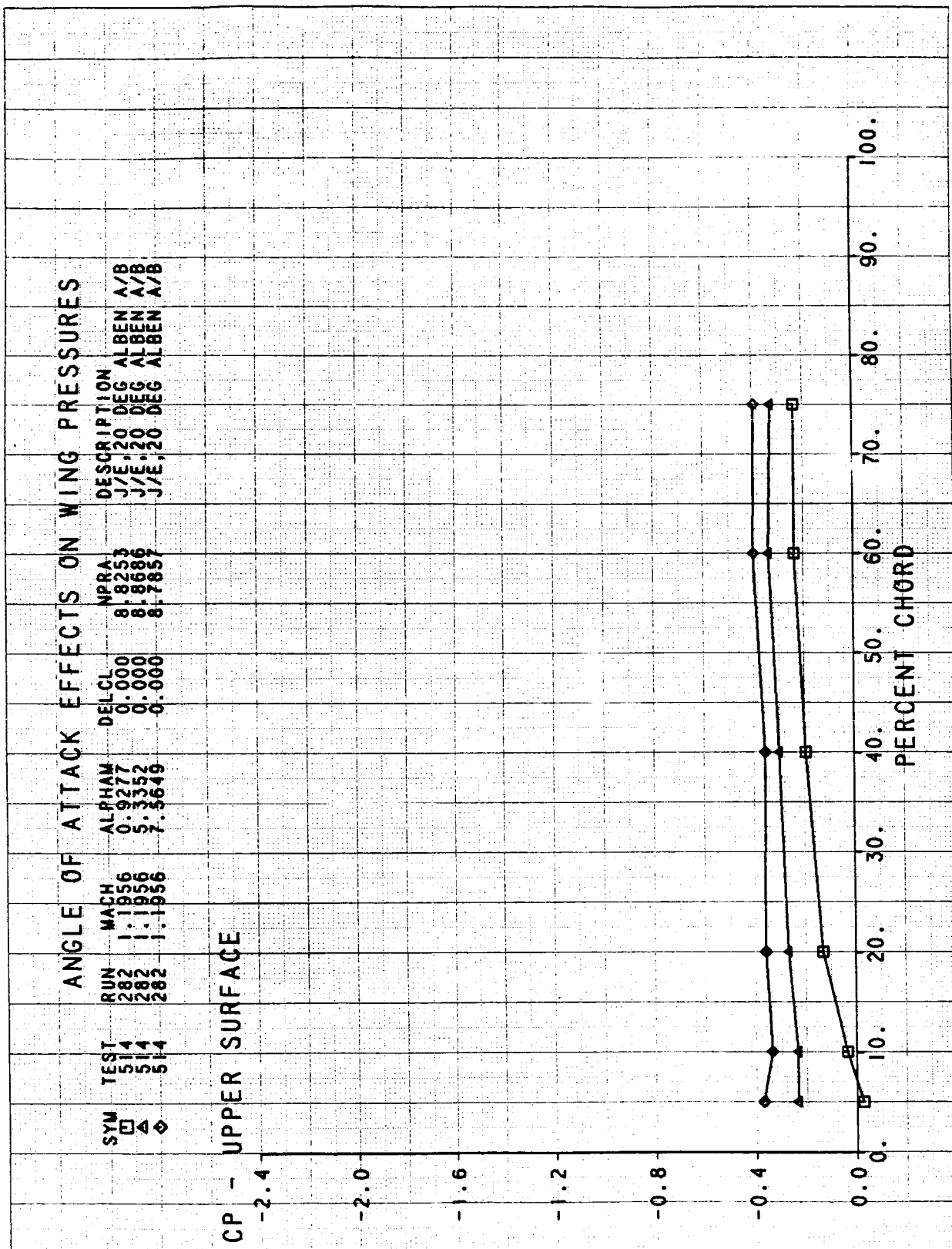


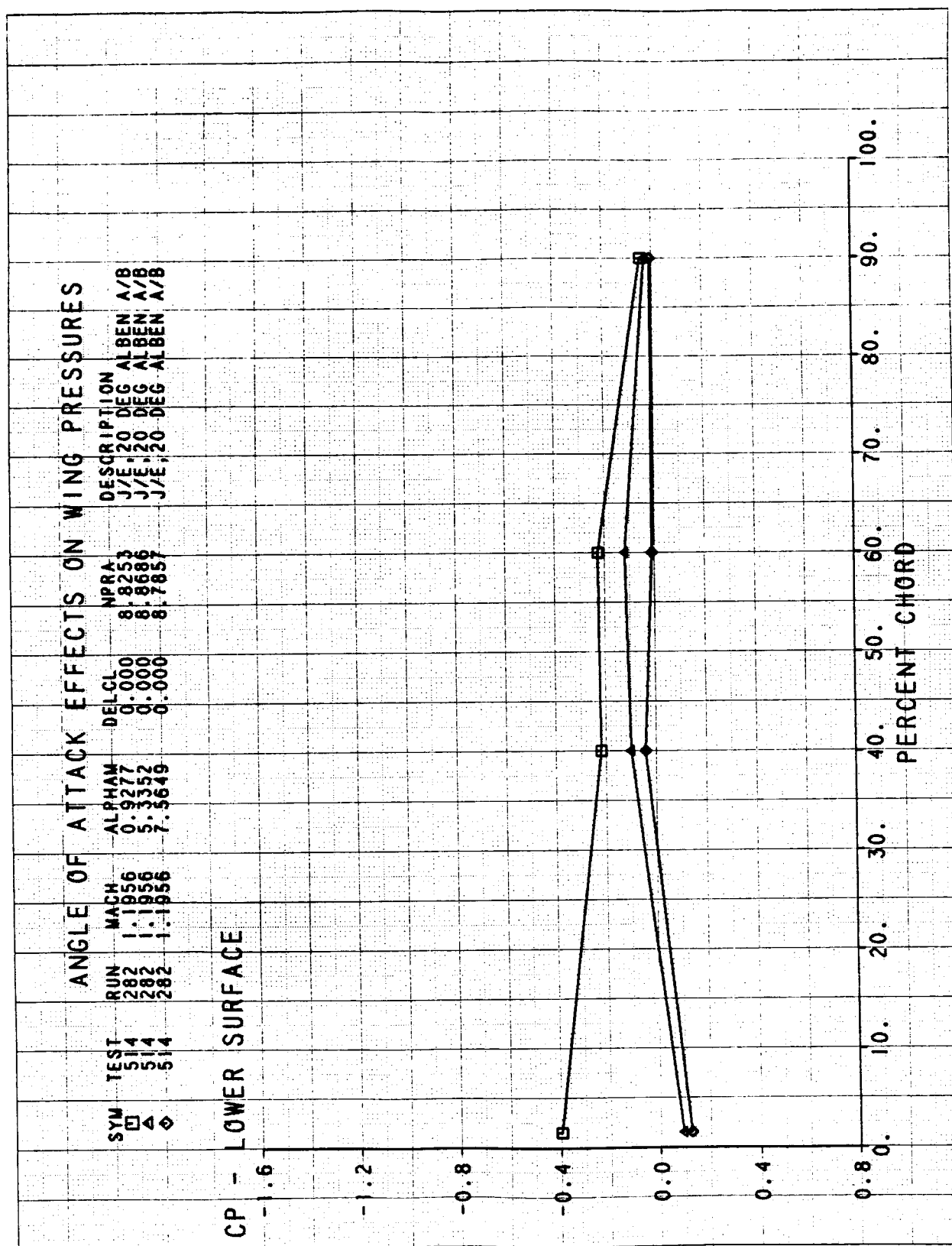


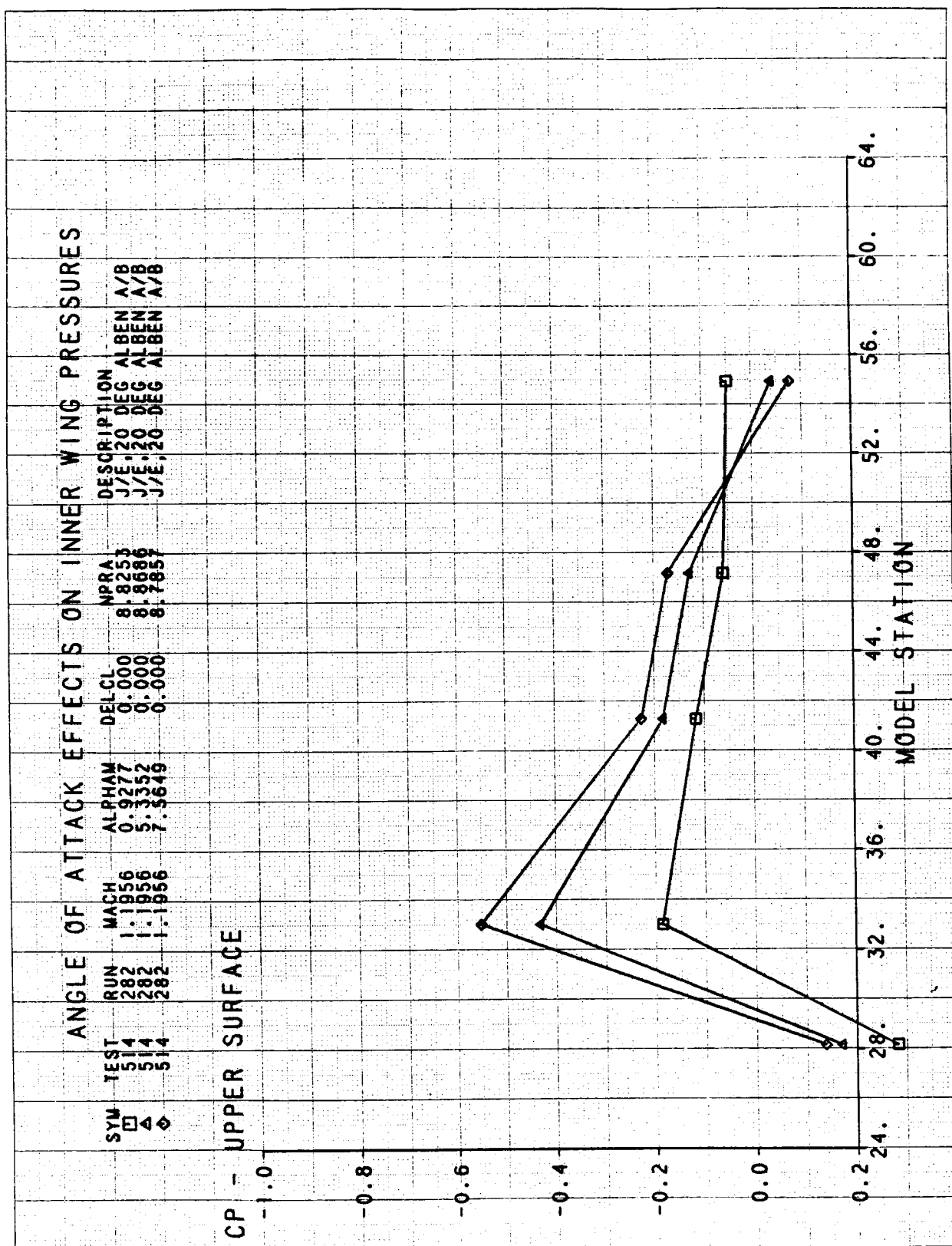




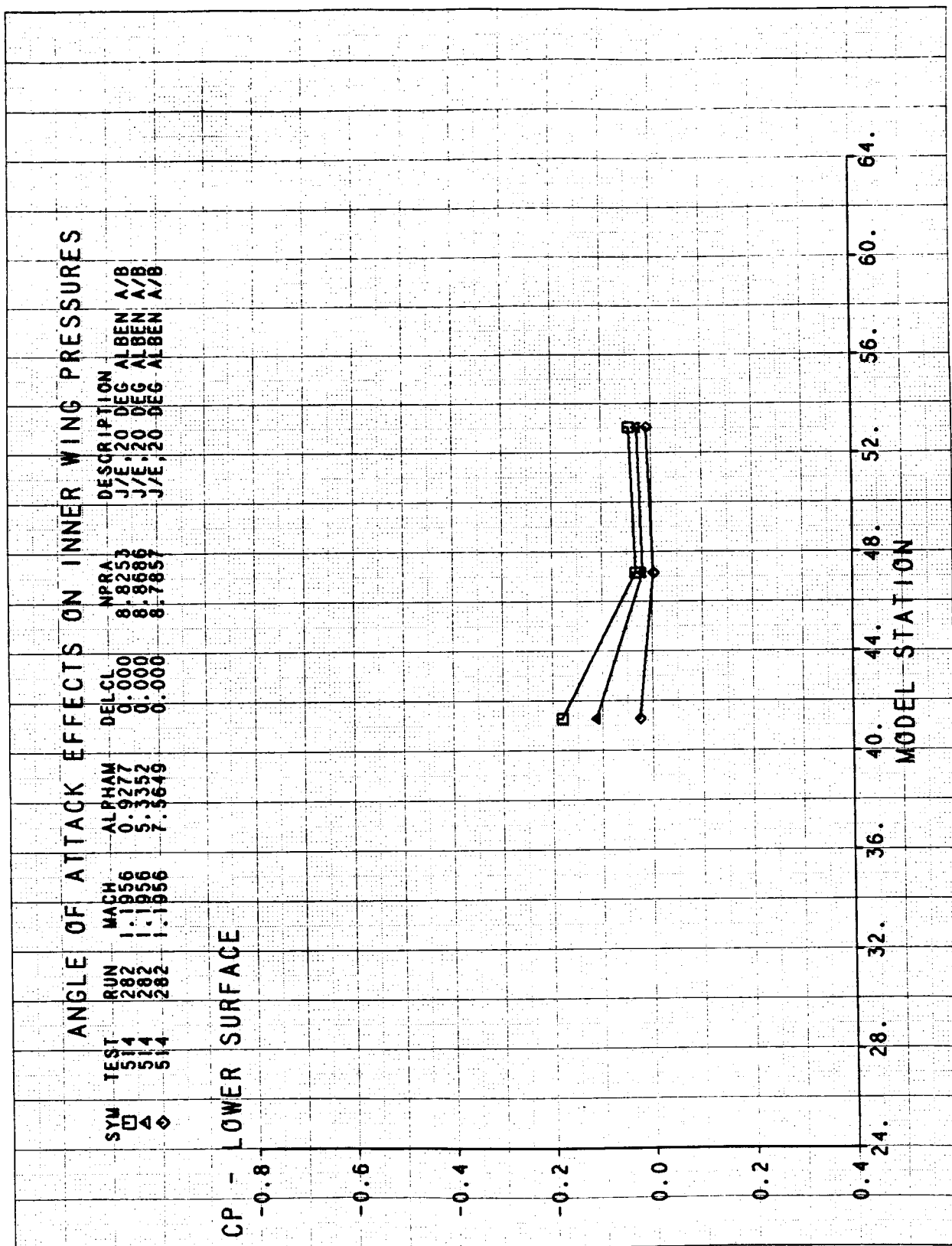


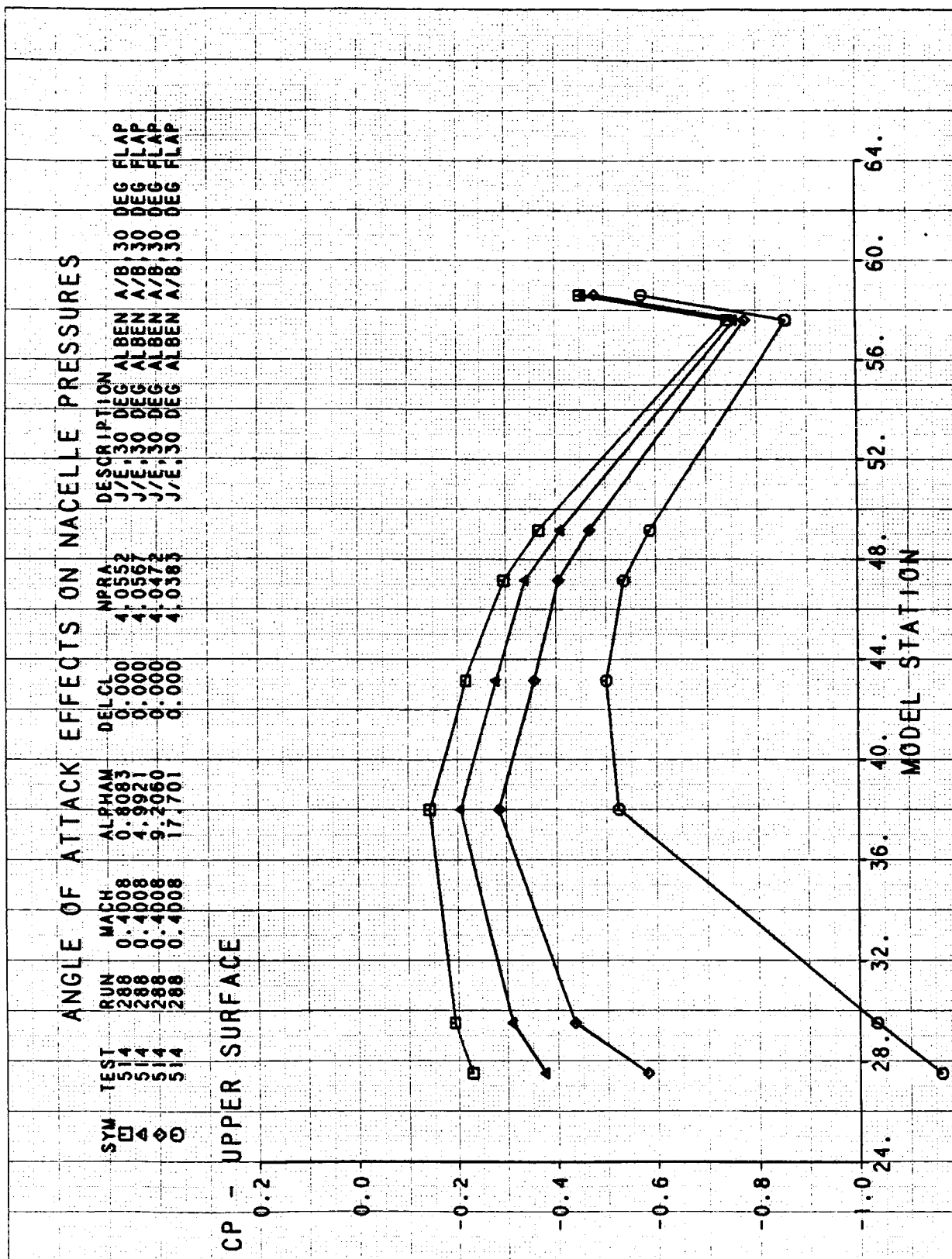


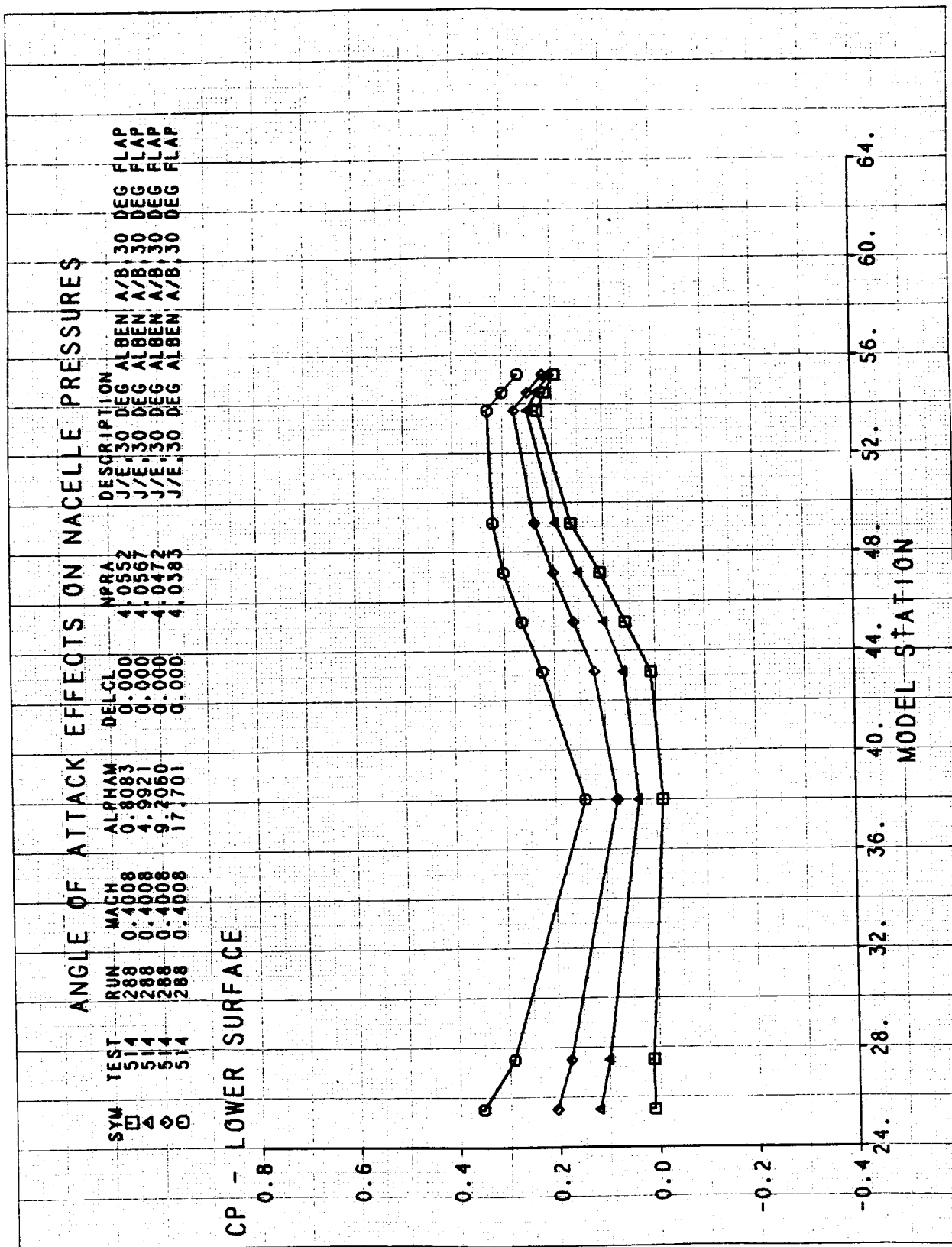


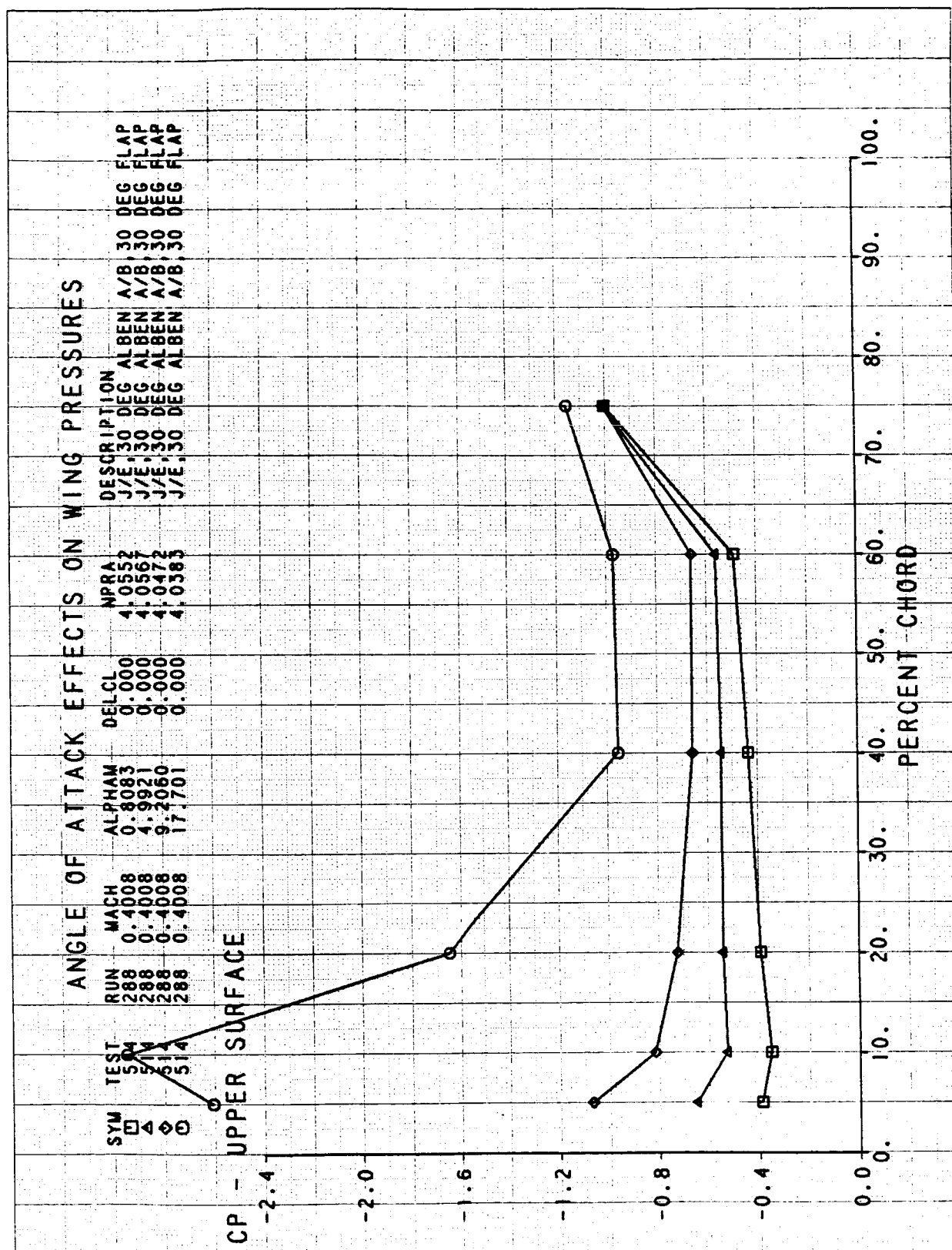


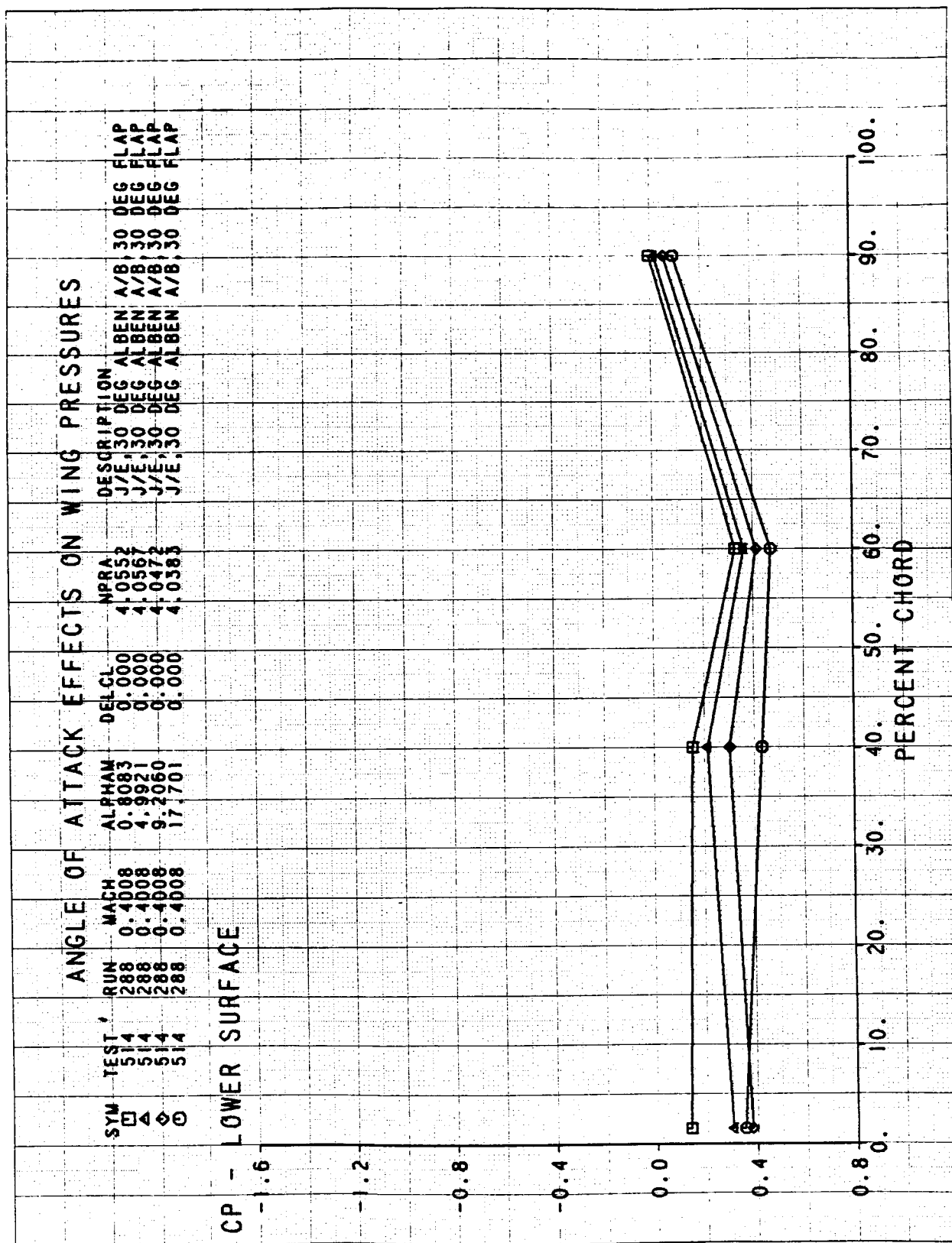


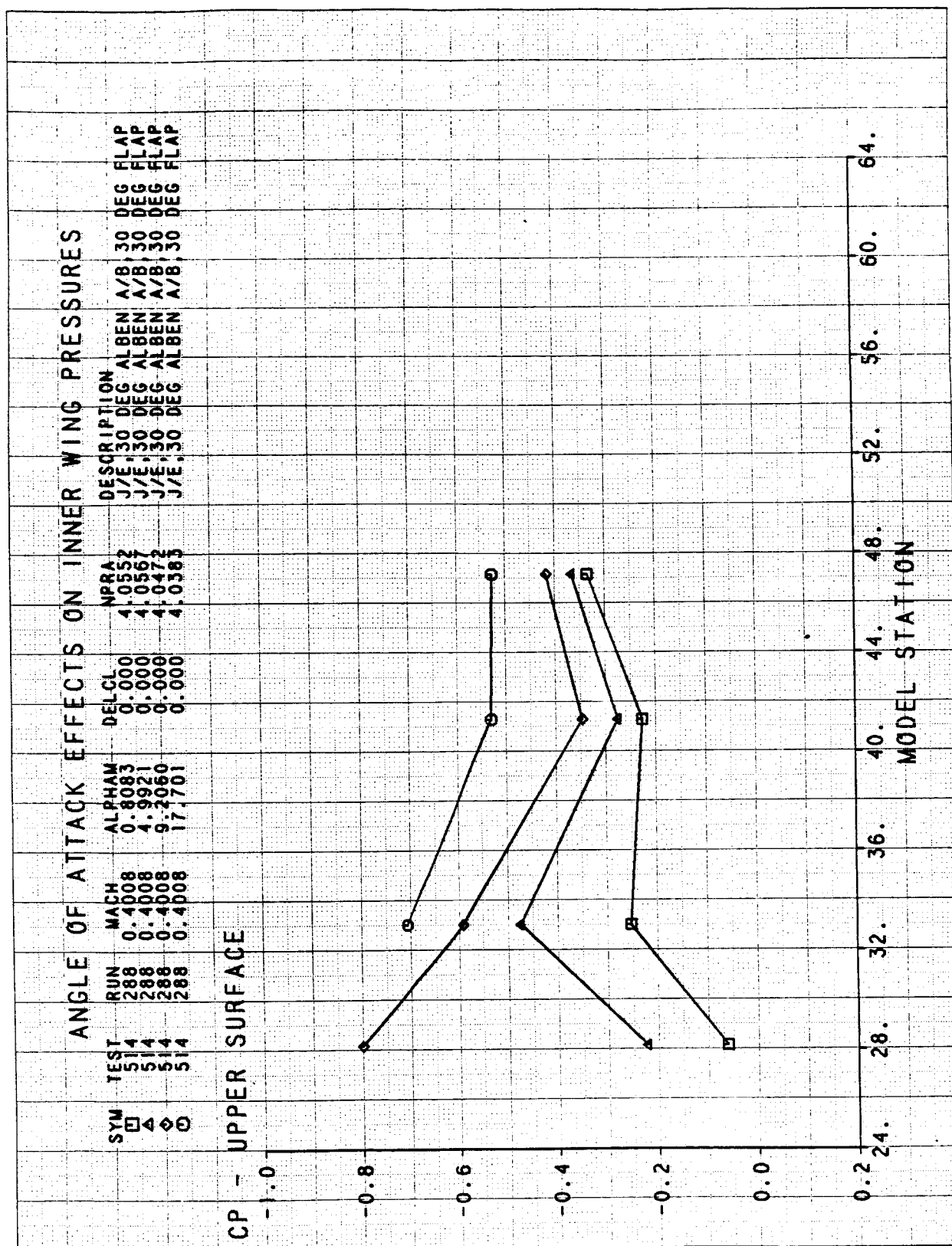


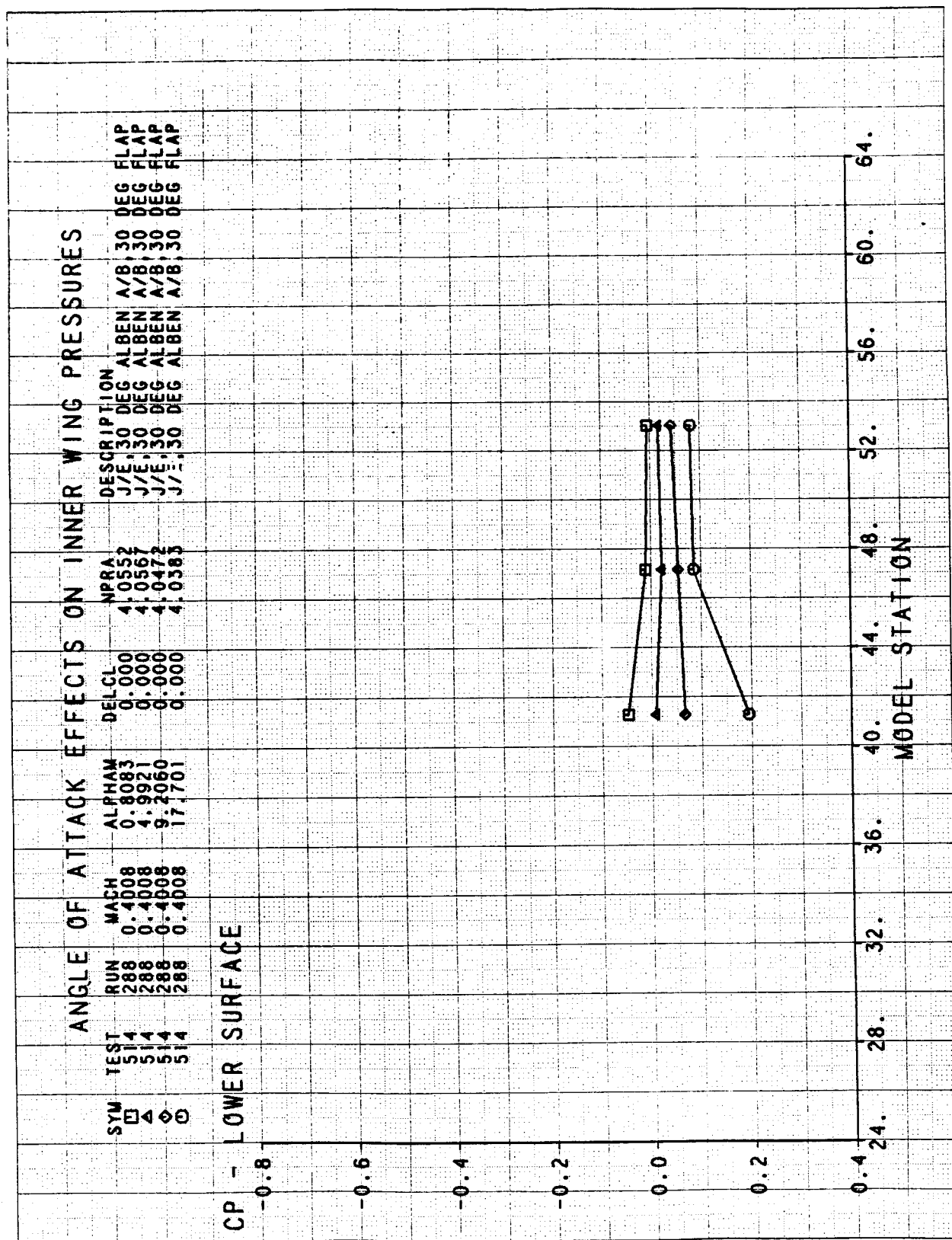


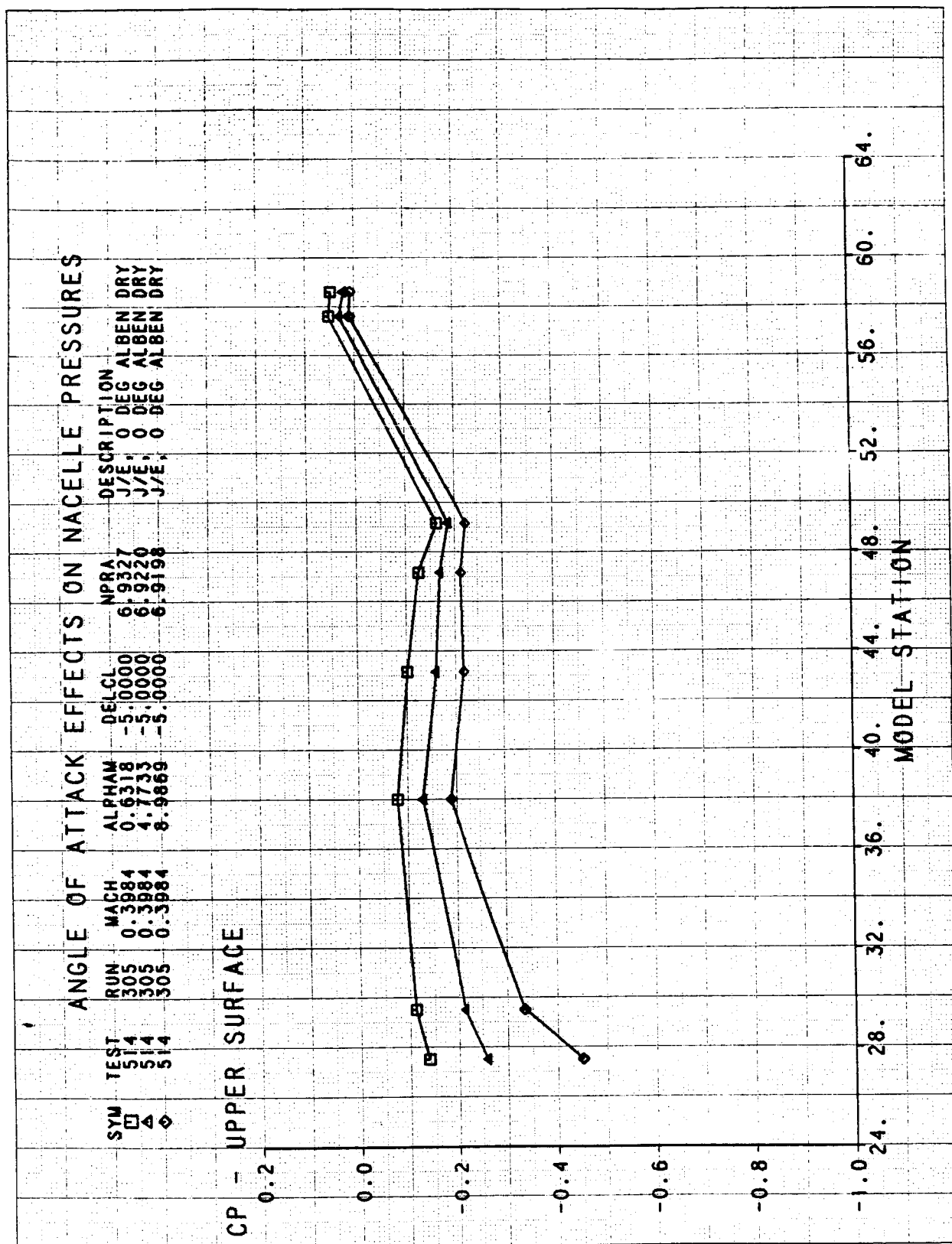




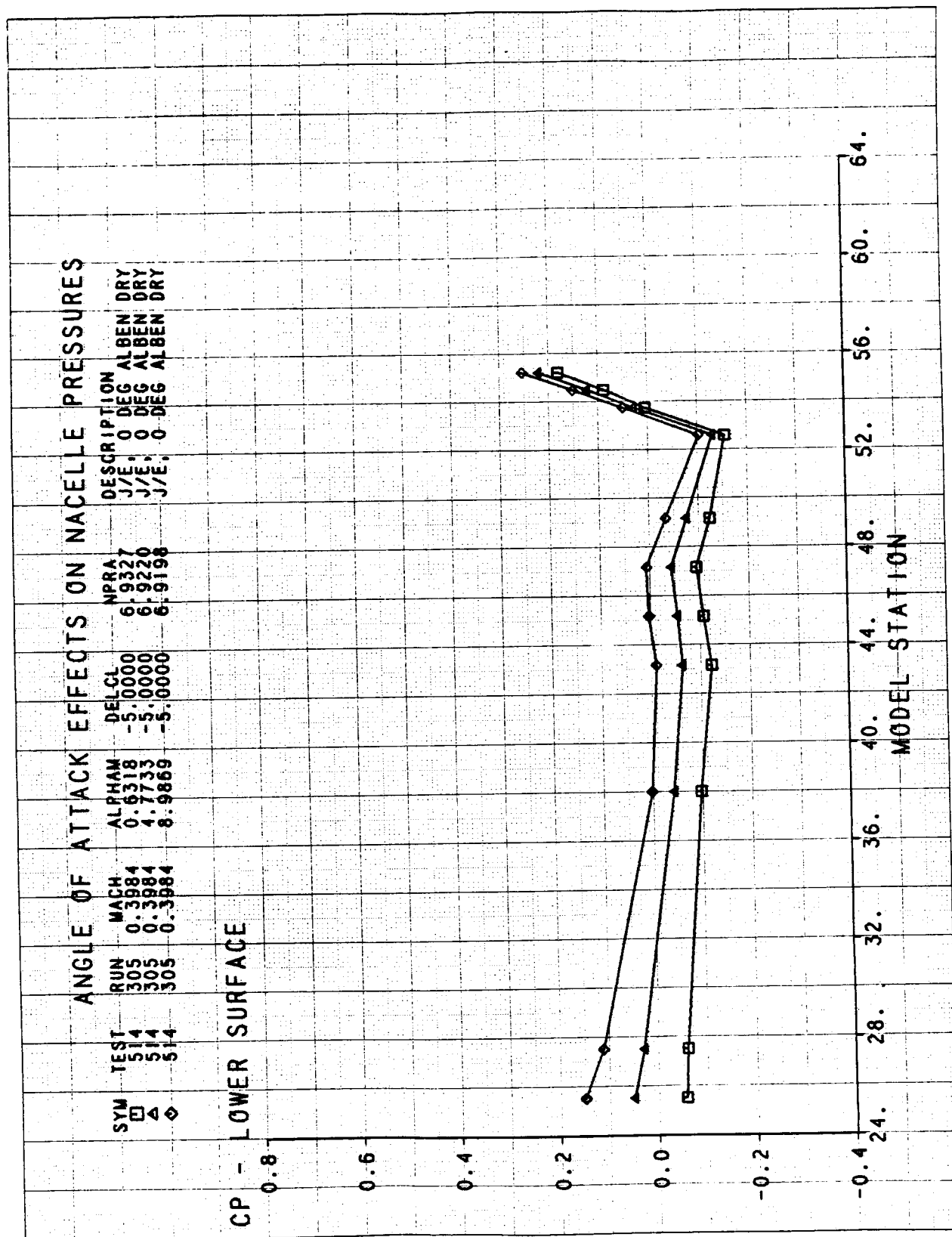


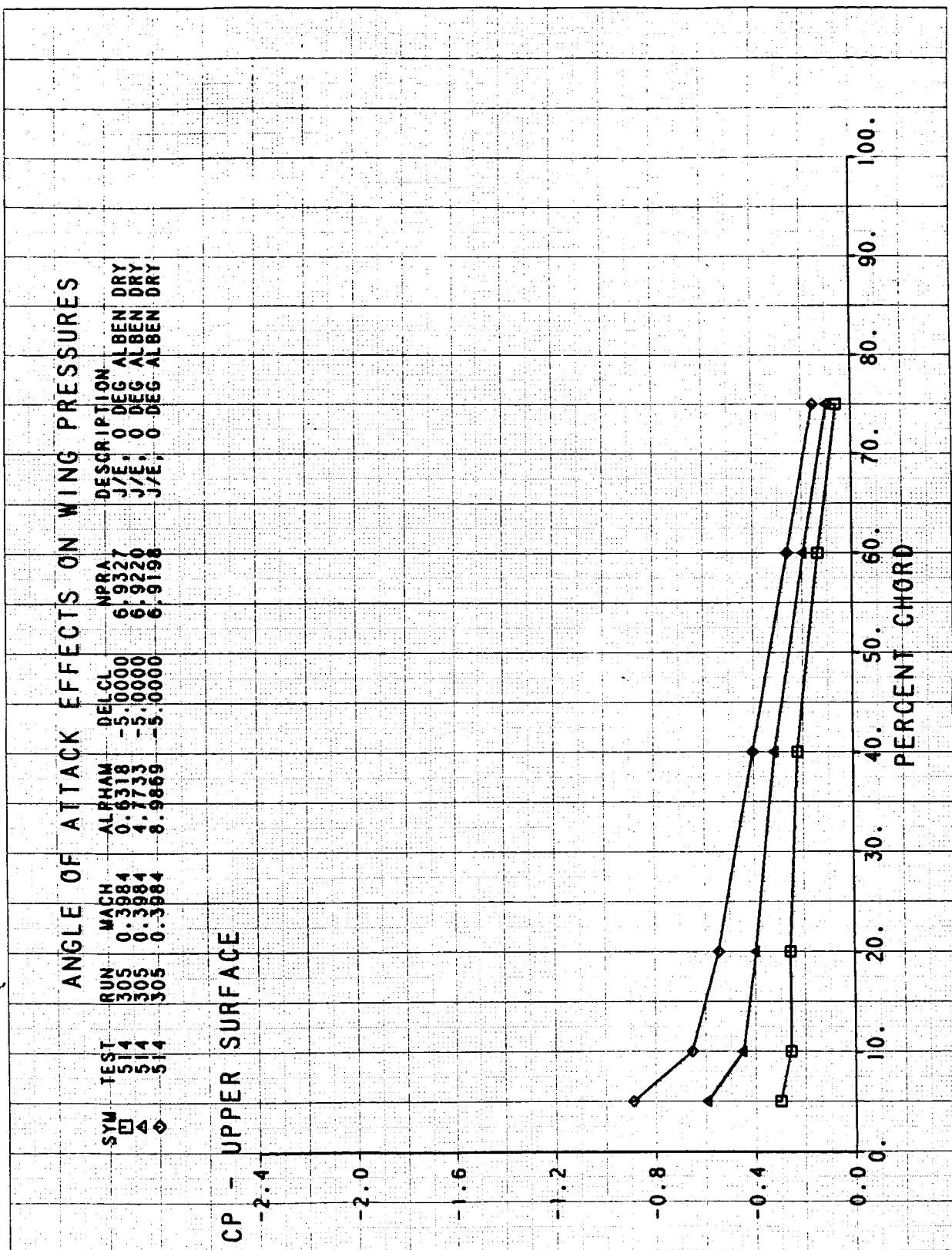


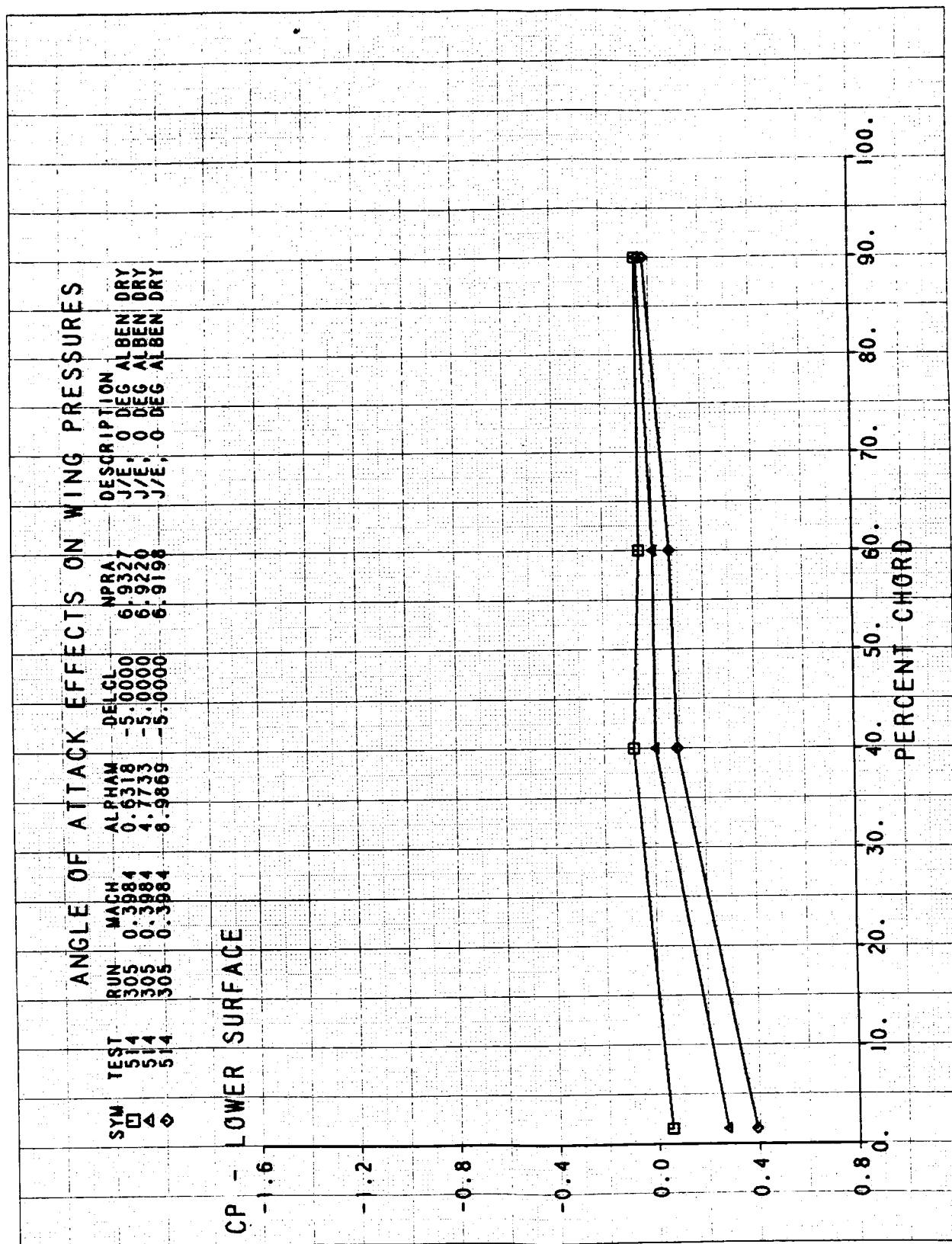


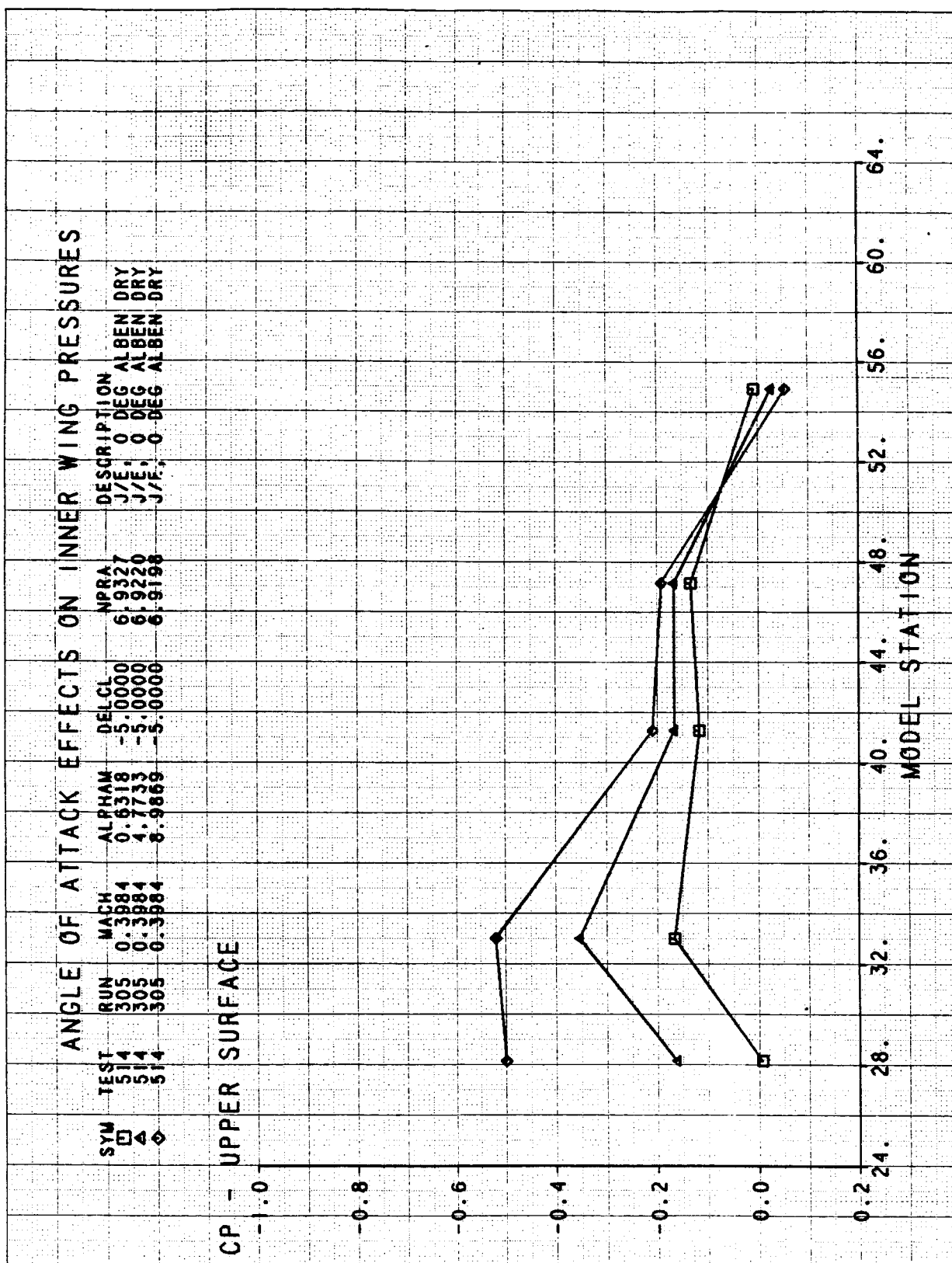


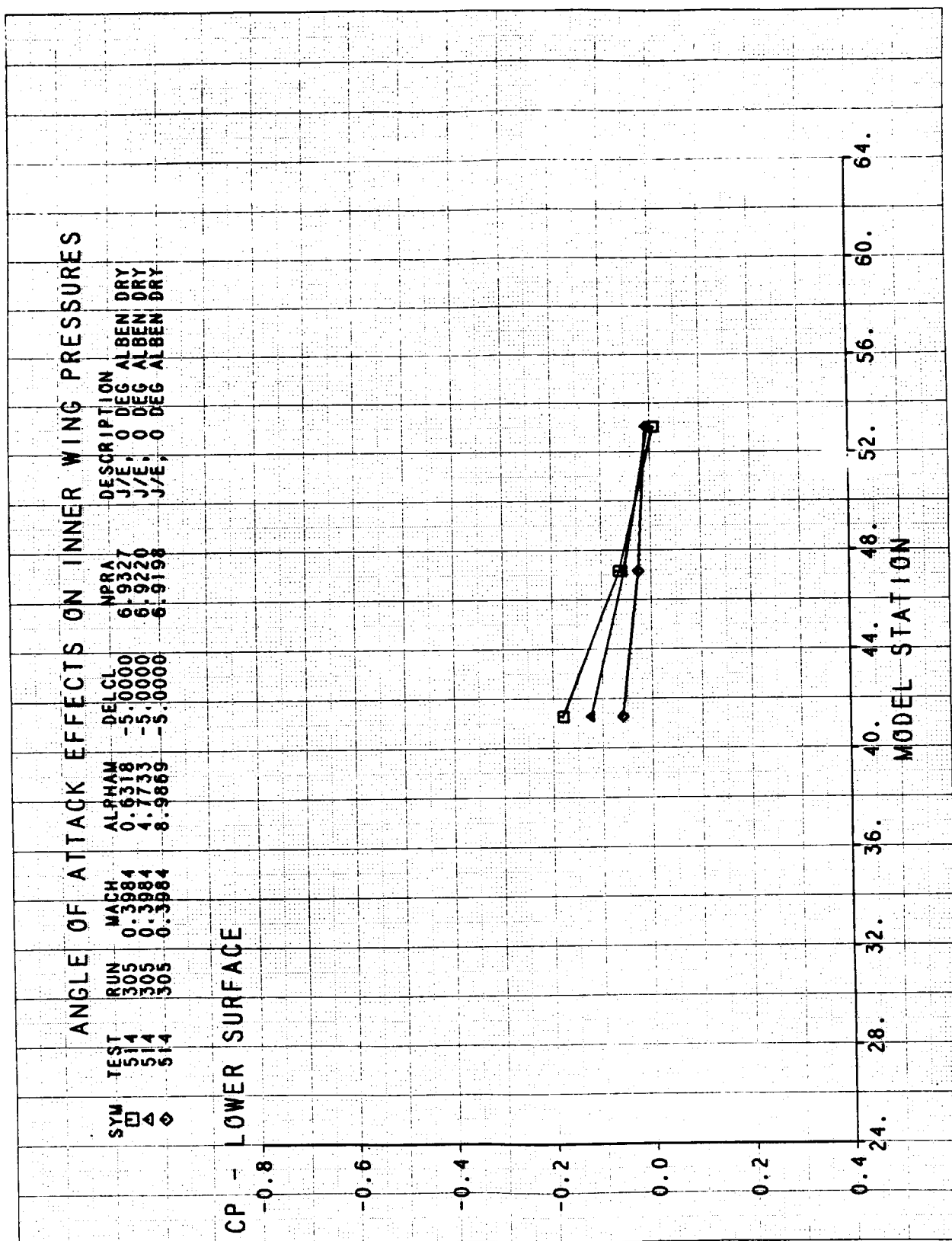


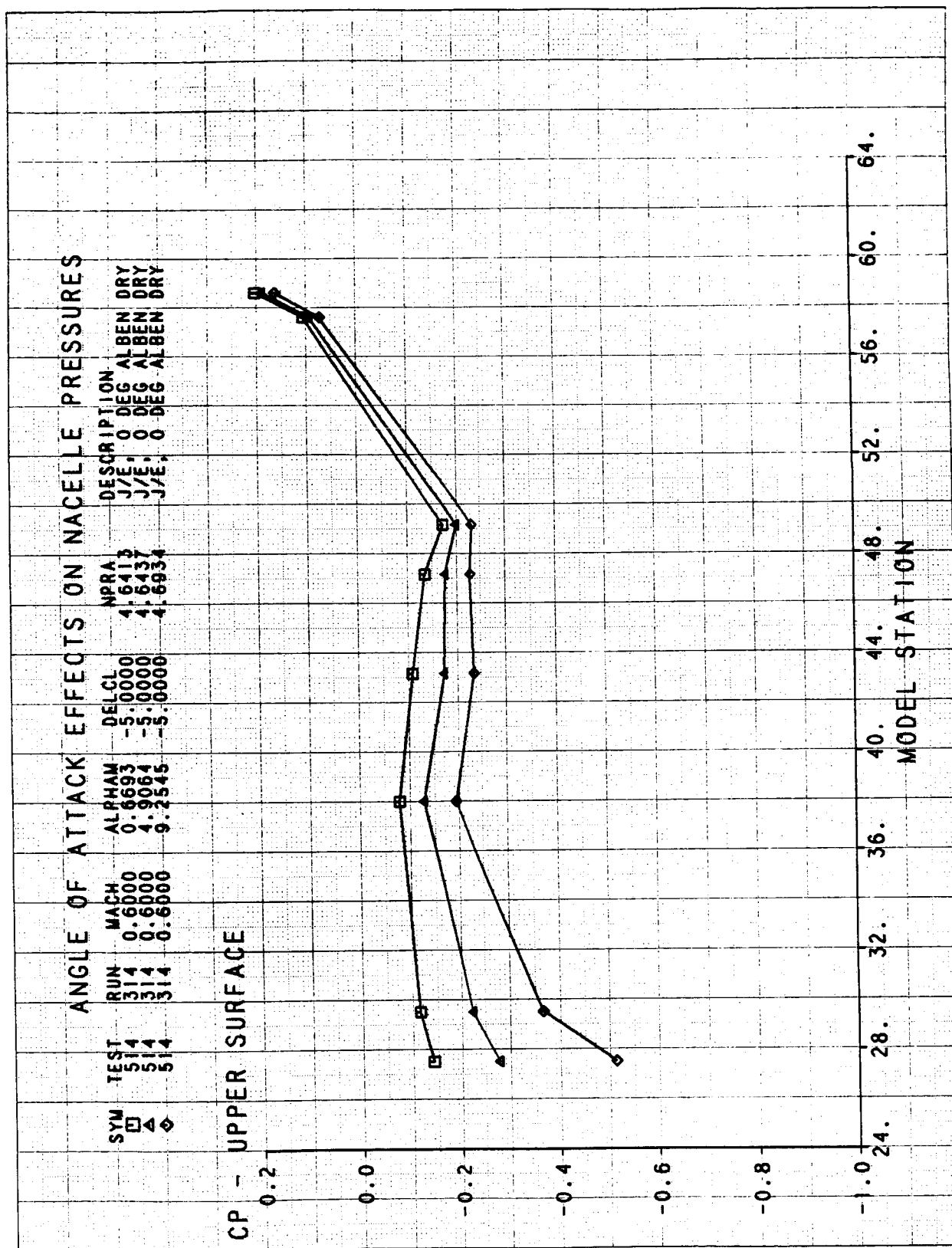


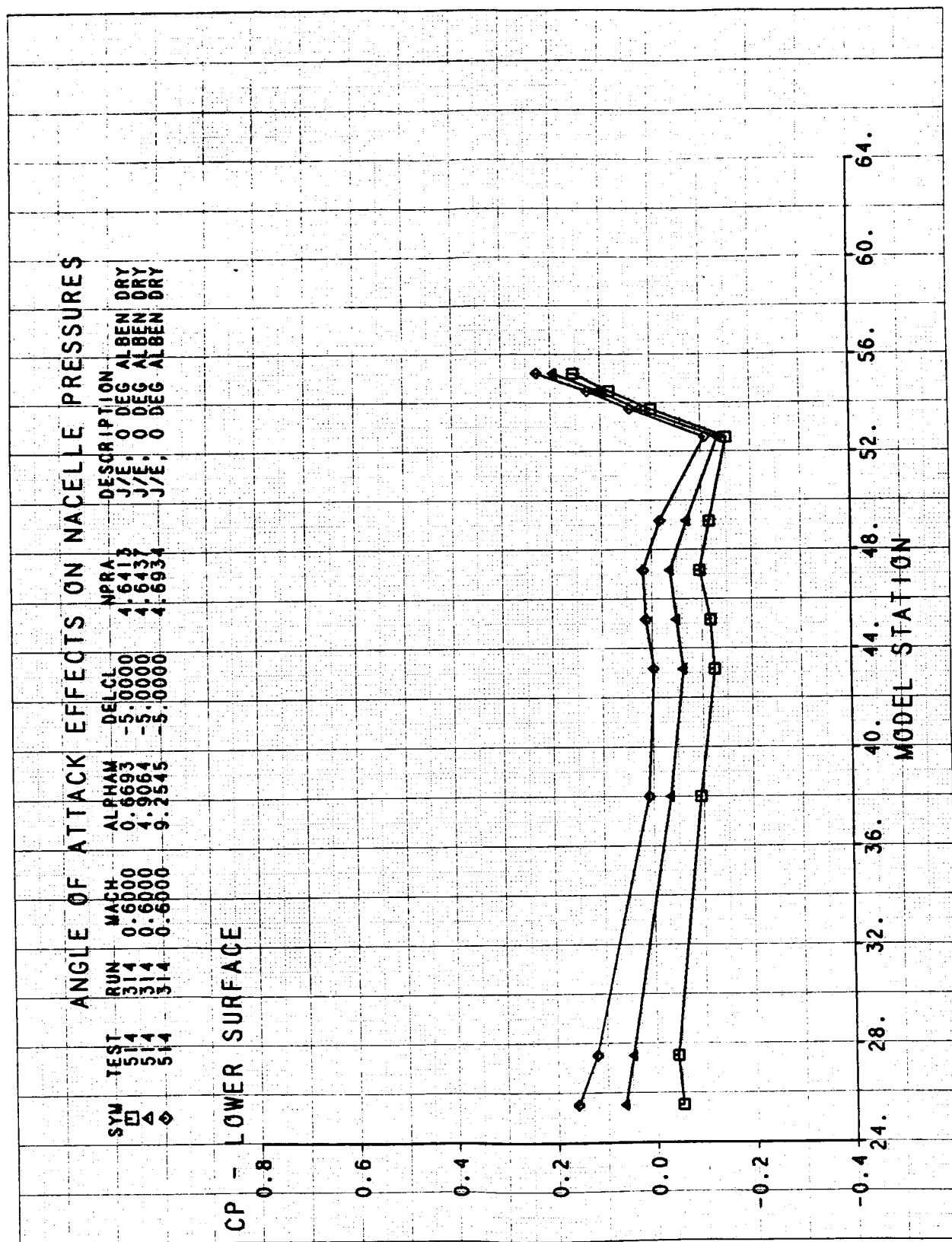


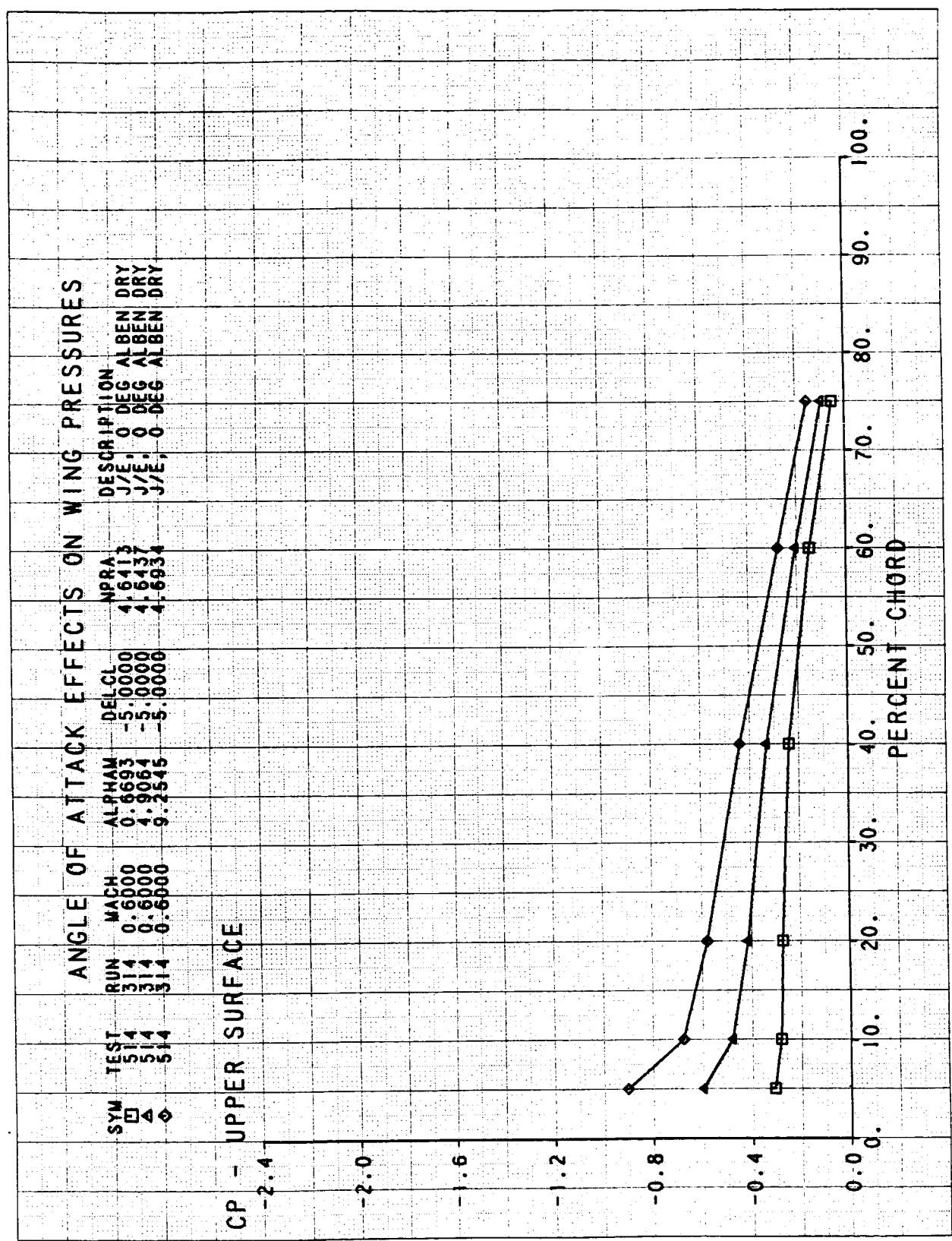




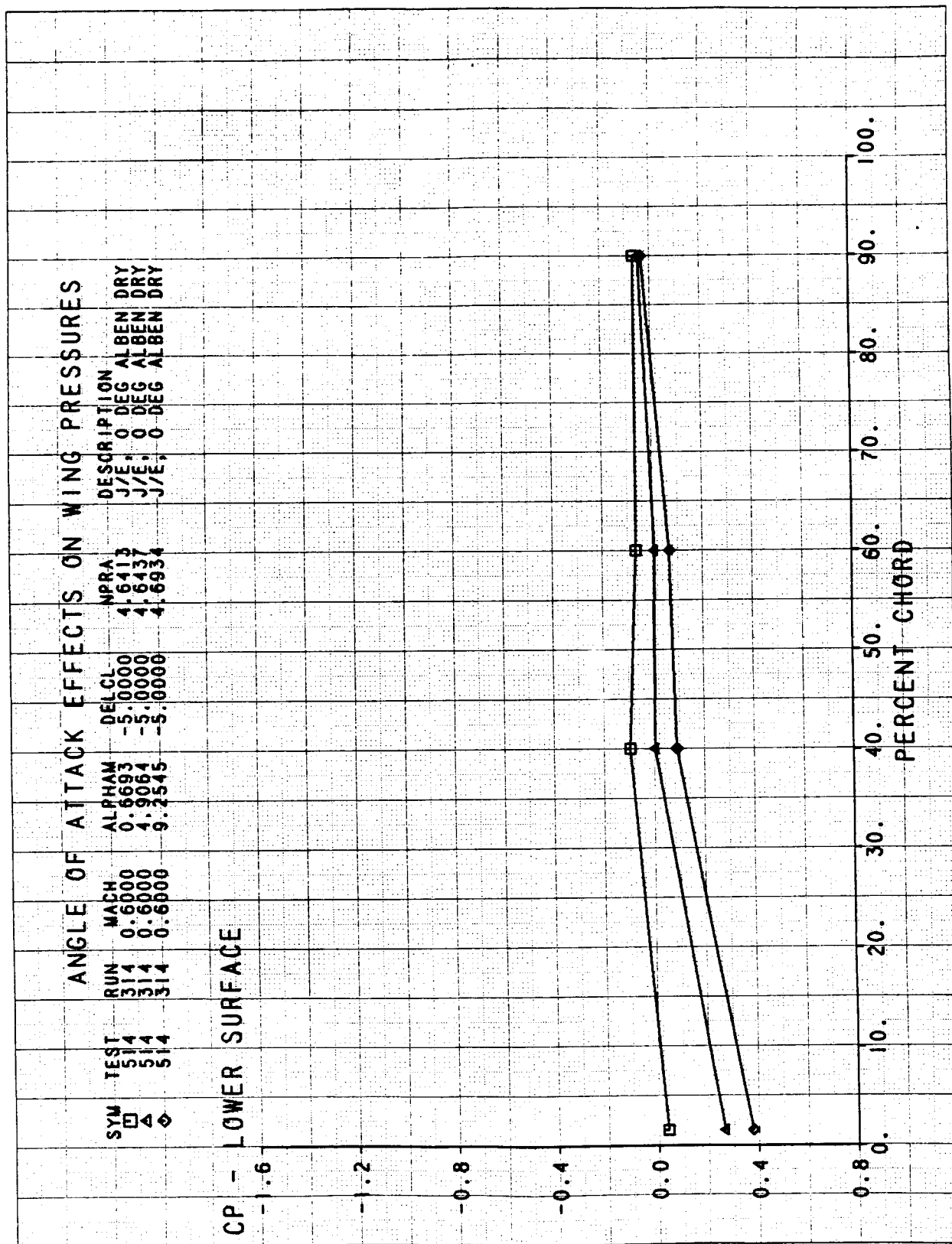


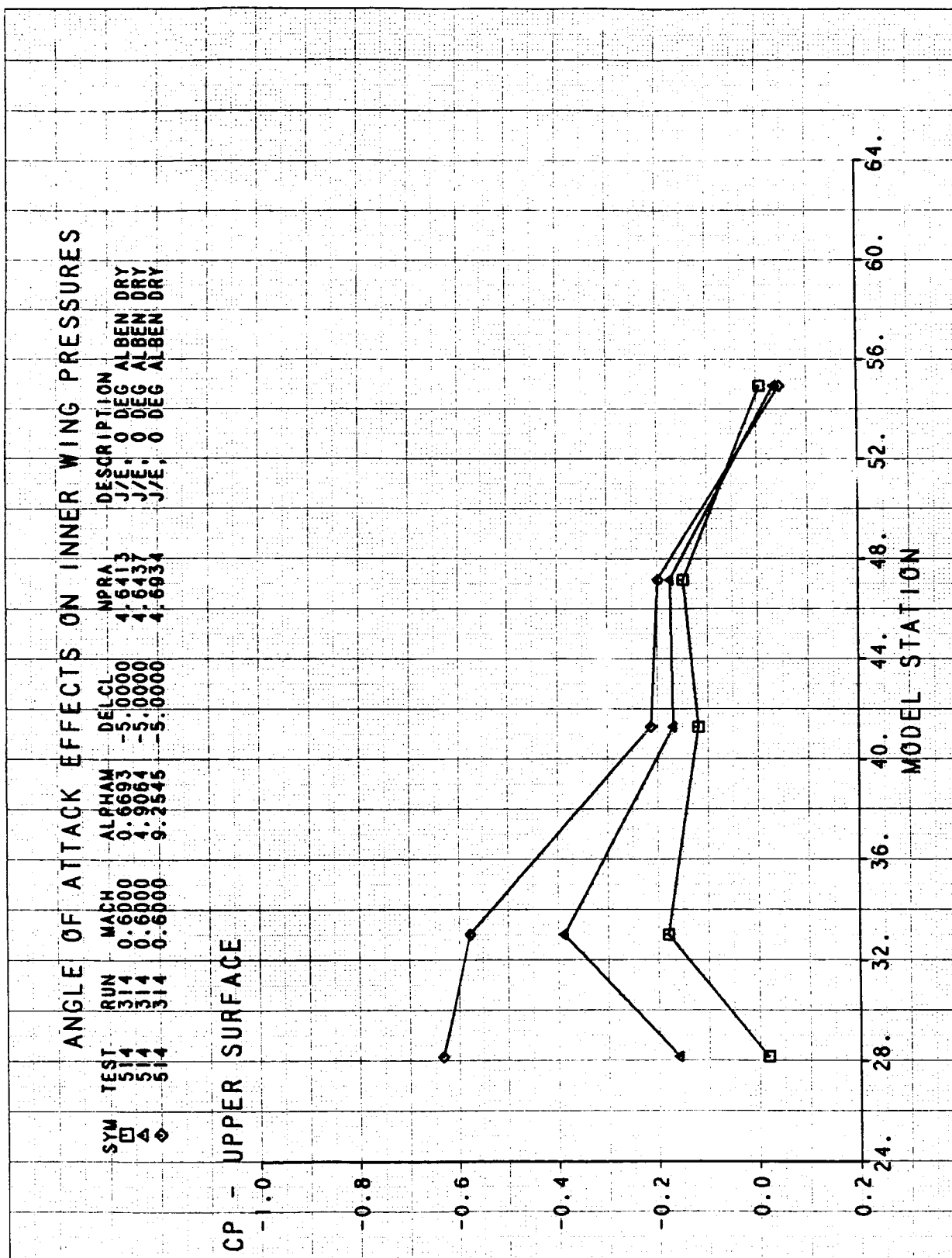


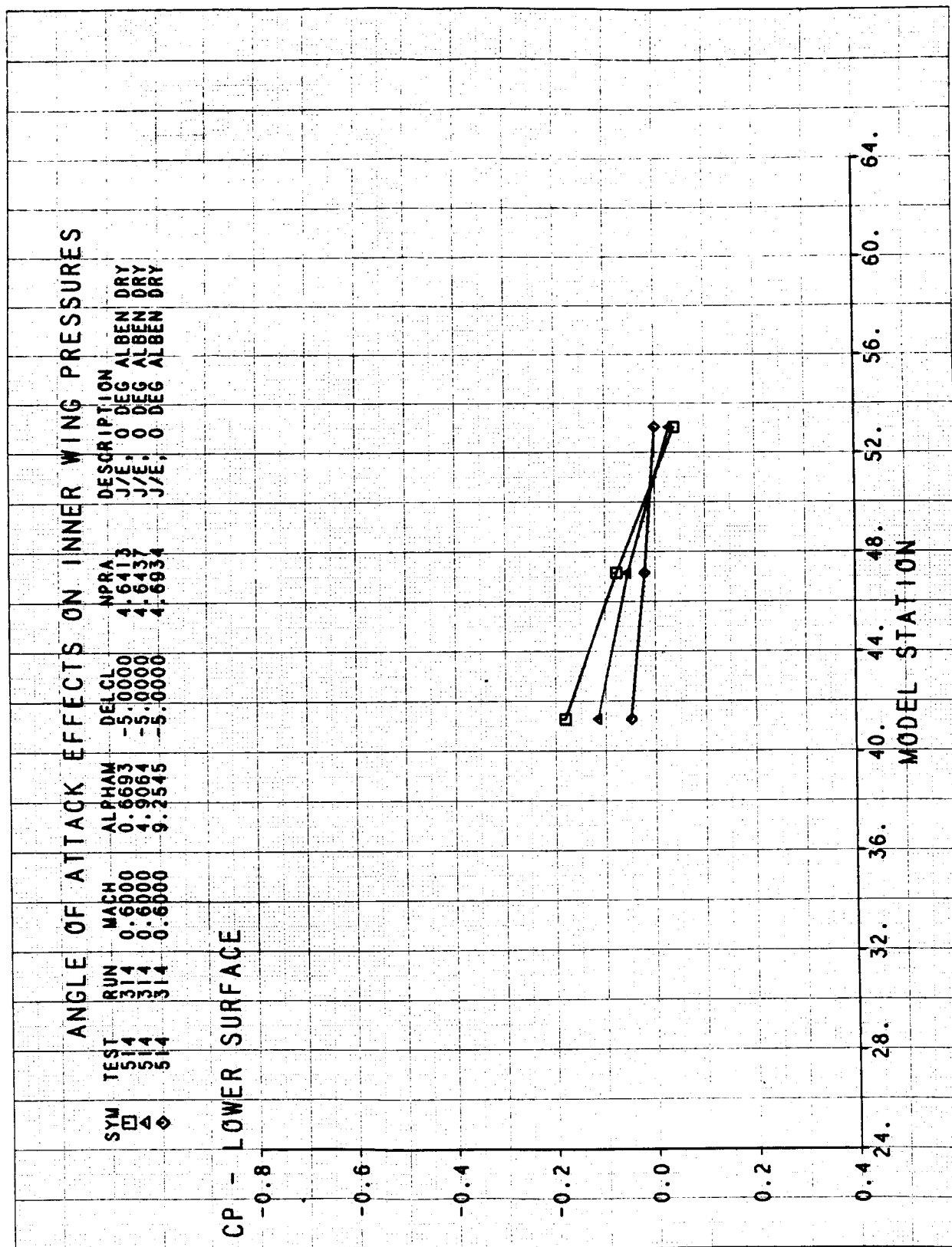


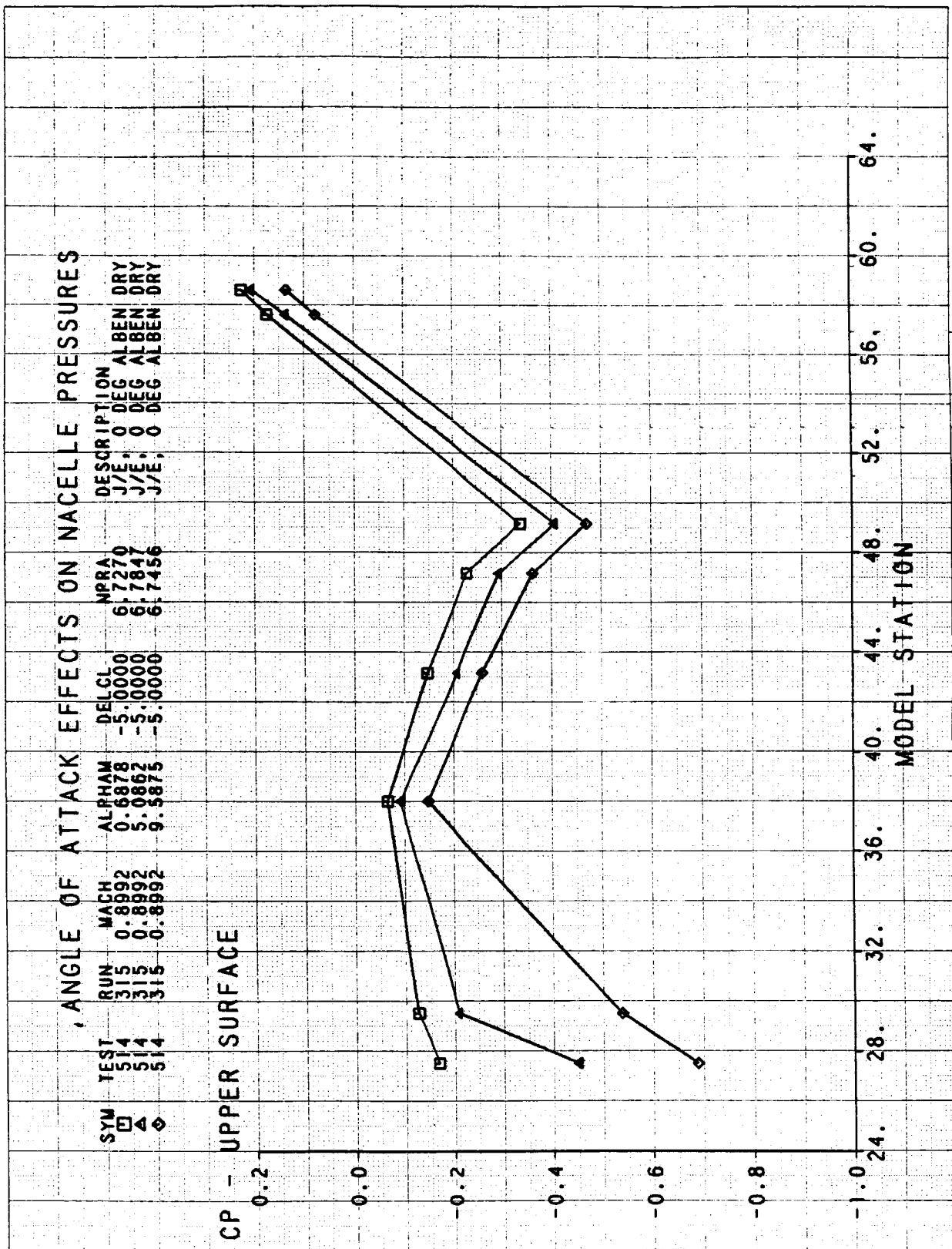


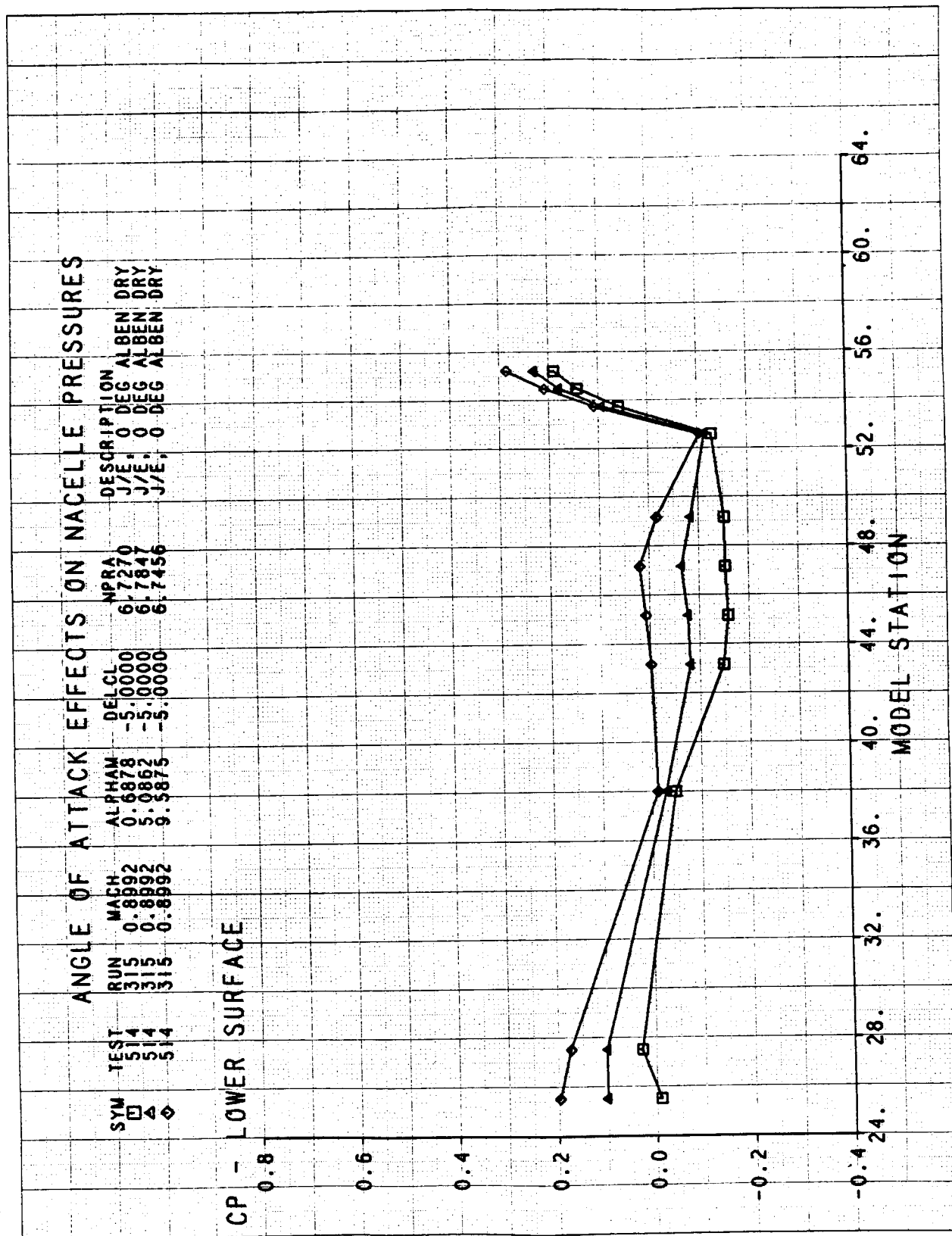


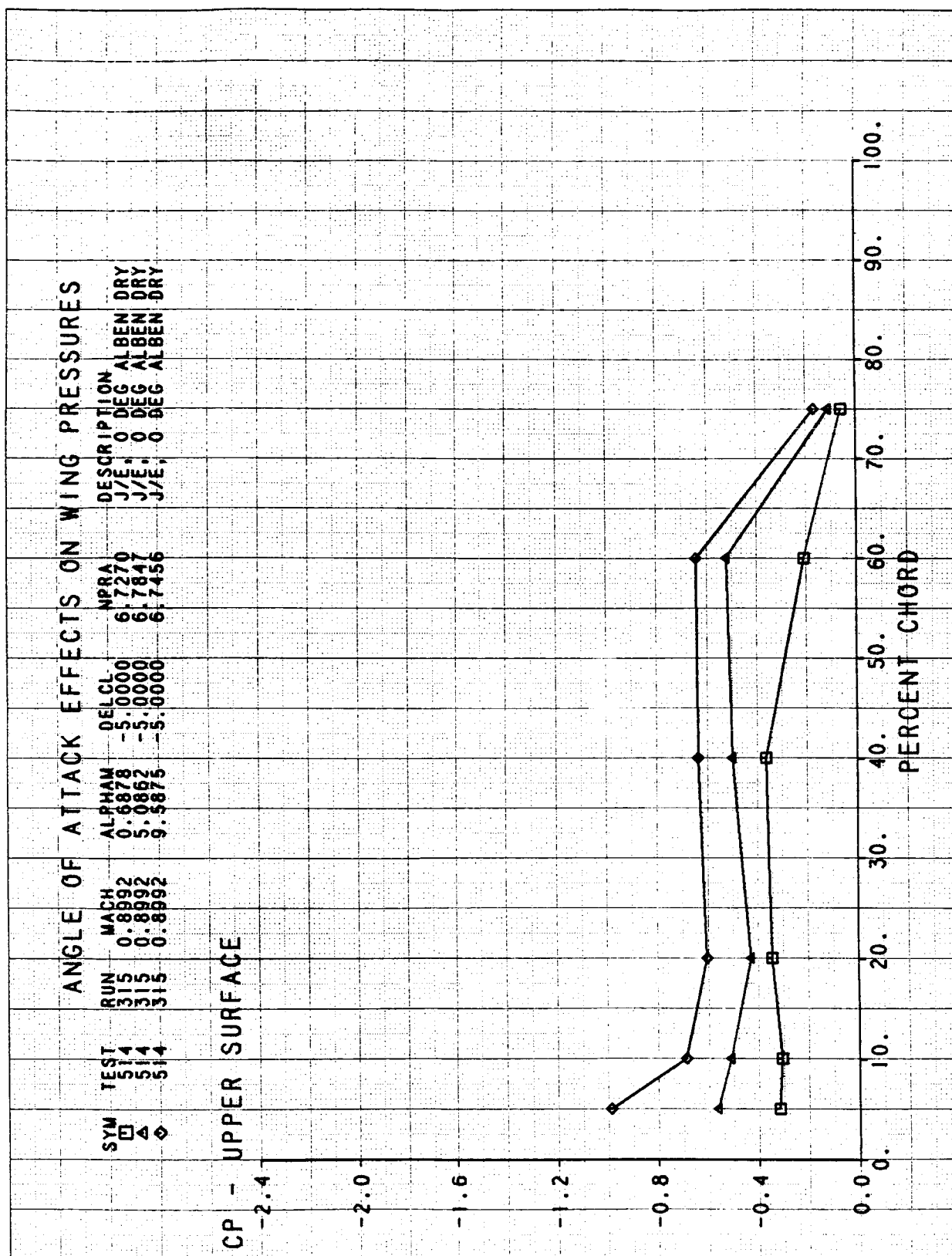


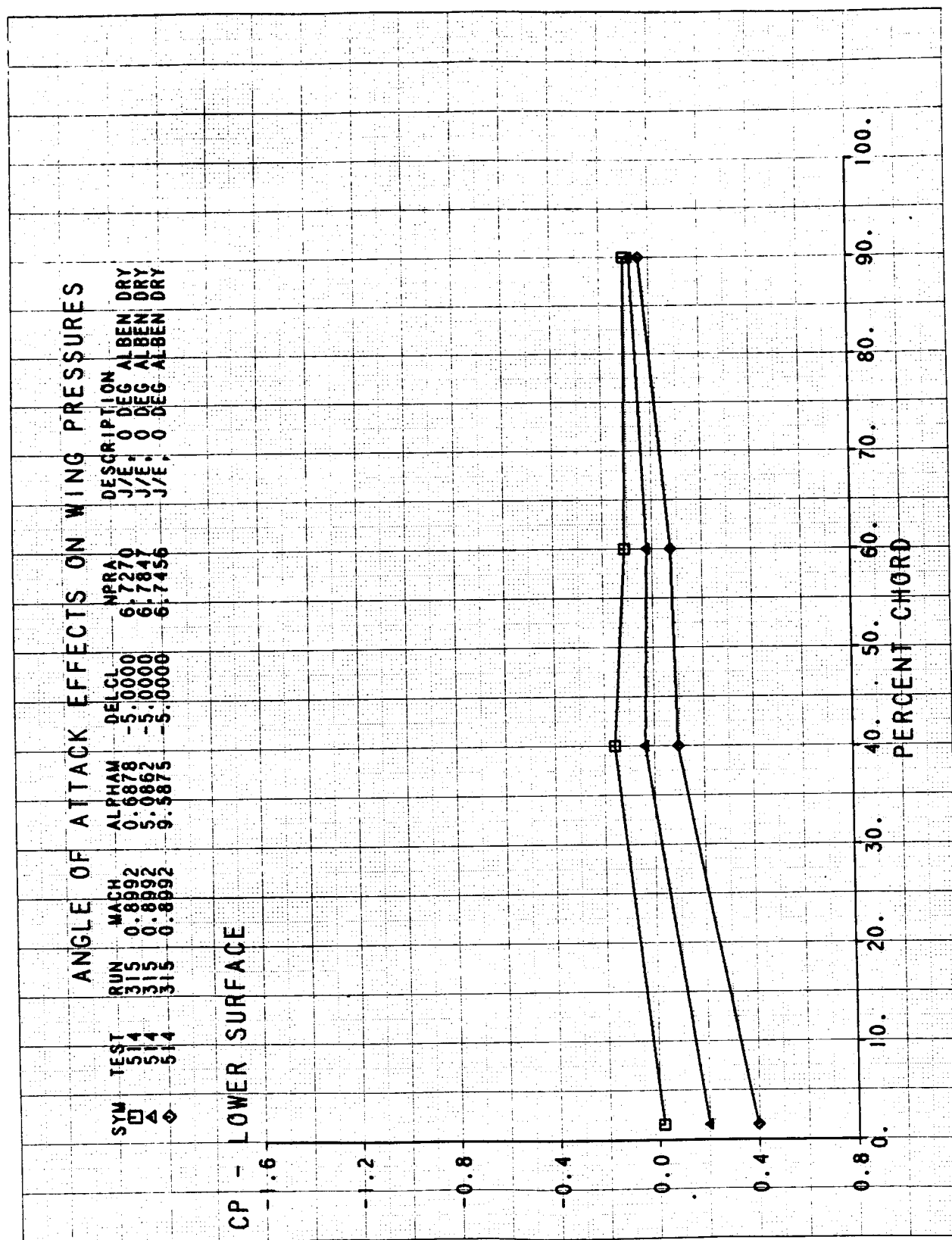








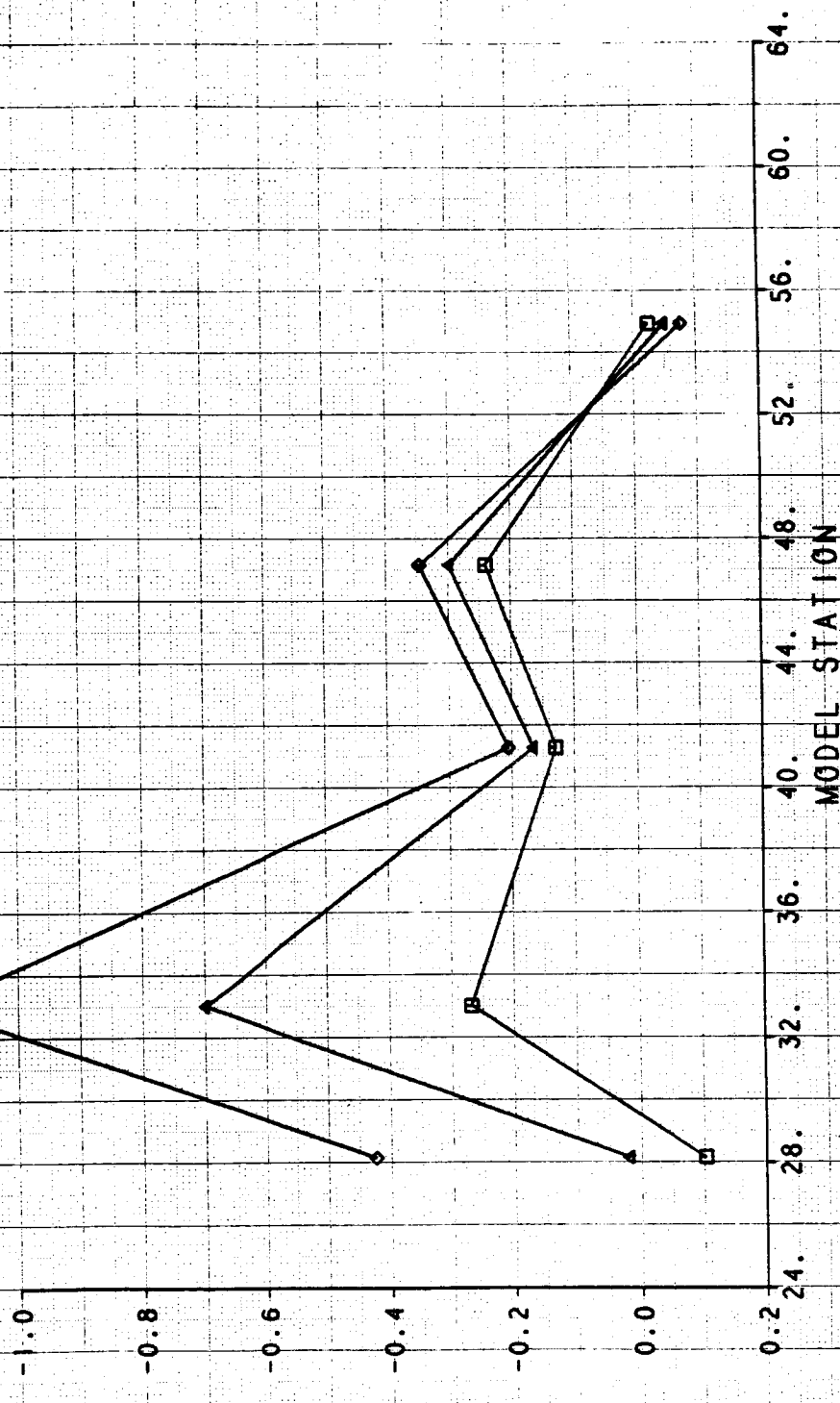




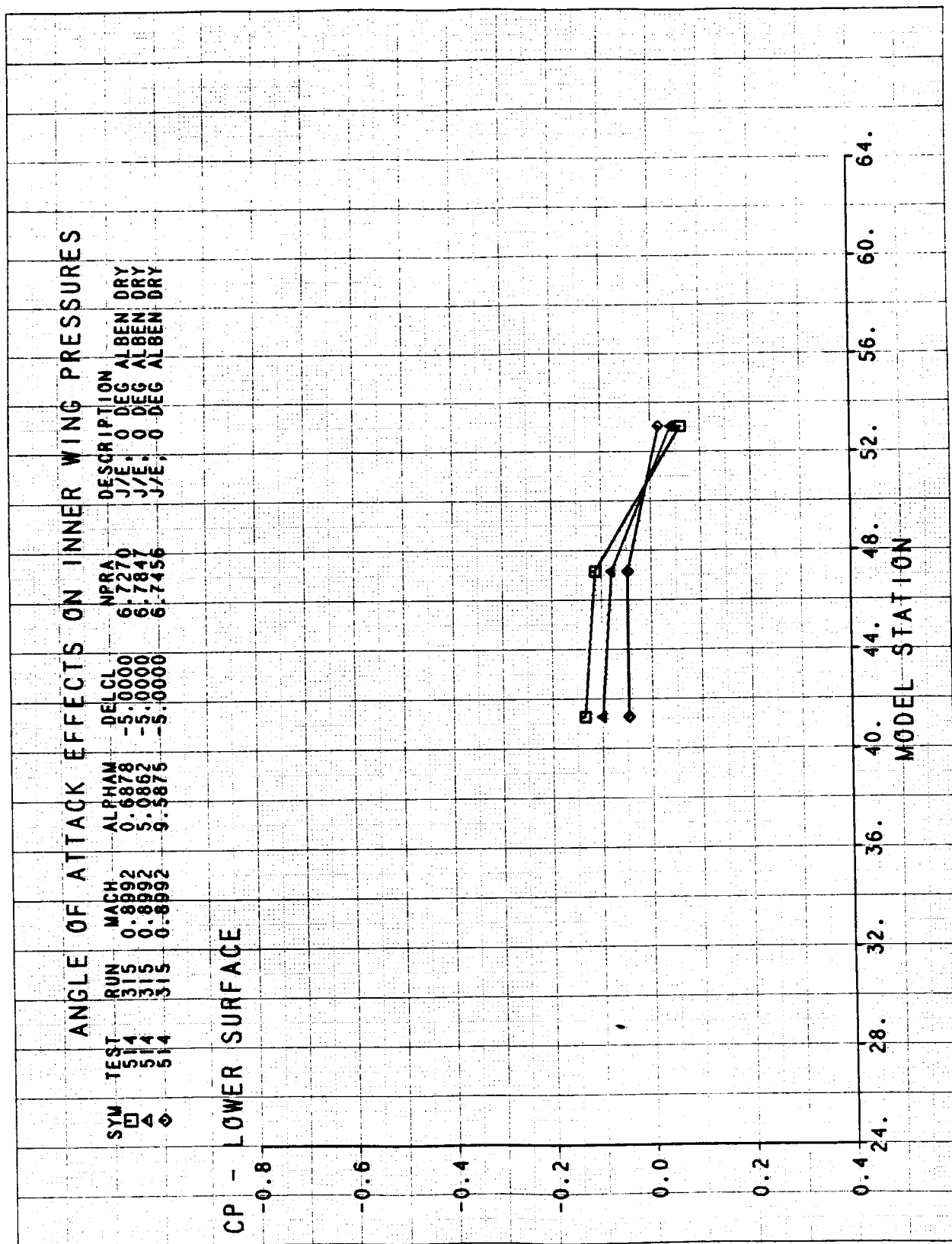
# ANGLE OF ATTACK EFFECTS ON INNER WING PRESSURES

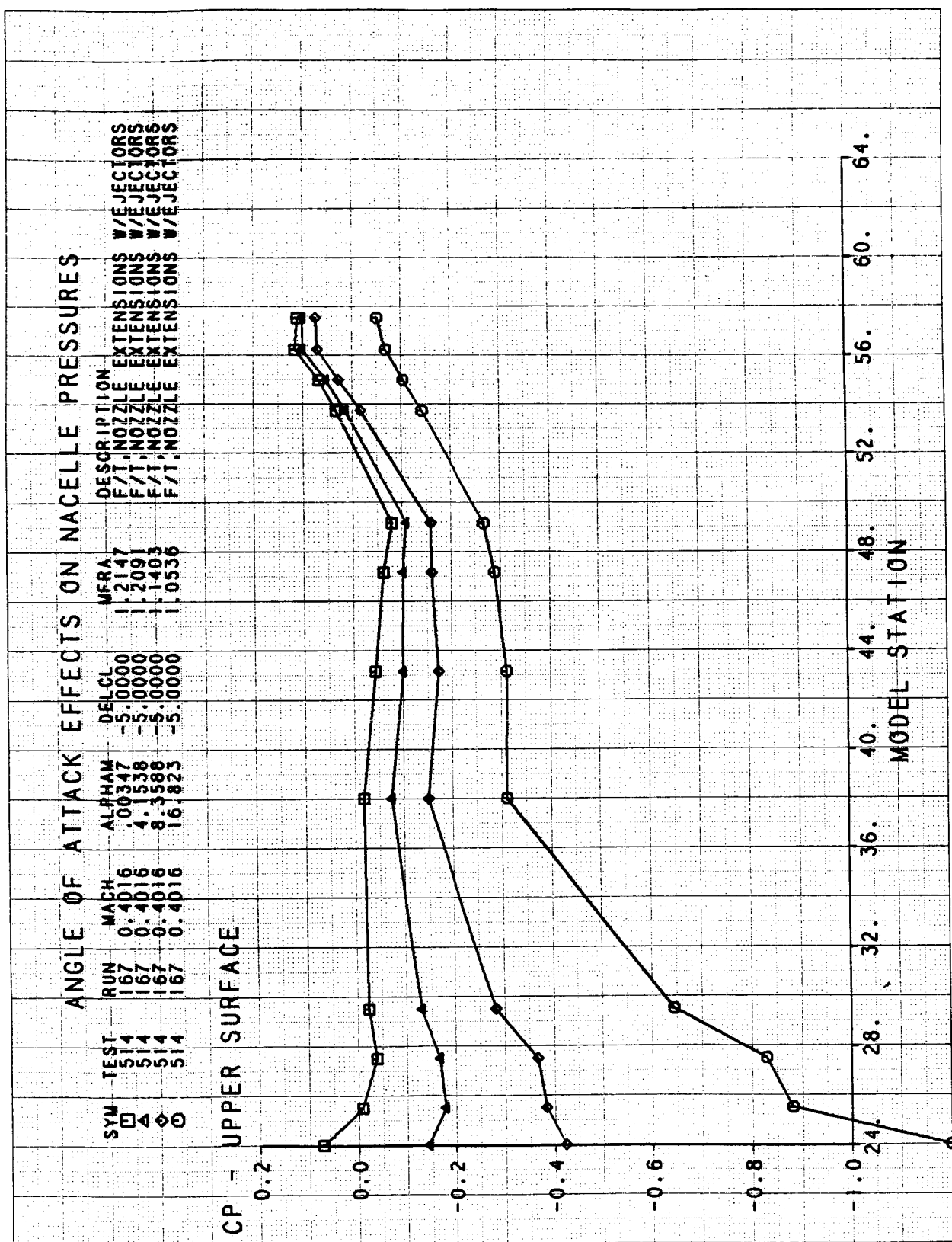
TEST	RUN	MACH	ALPHA	DELCL	NPRA	DESCRIPTION
514	315	0.8992	0.6878	-5.0000	6.7270	J/E: 0 DEG ALBEN DRY
514	315	0.8992	5.0862	-5.0000	6.7847	J/E: 0 DEG ALBEN DRY
514	315	0.8992	9.5875	-5.0000	6.7456	J/E: 0 DEG ALBEN DRY

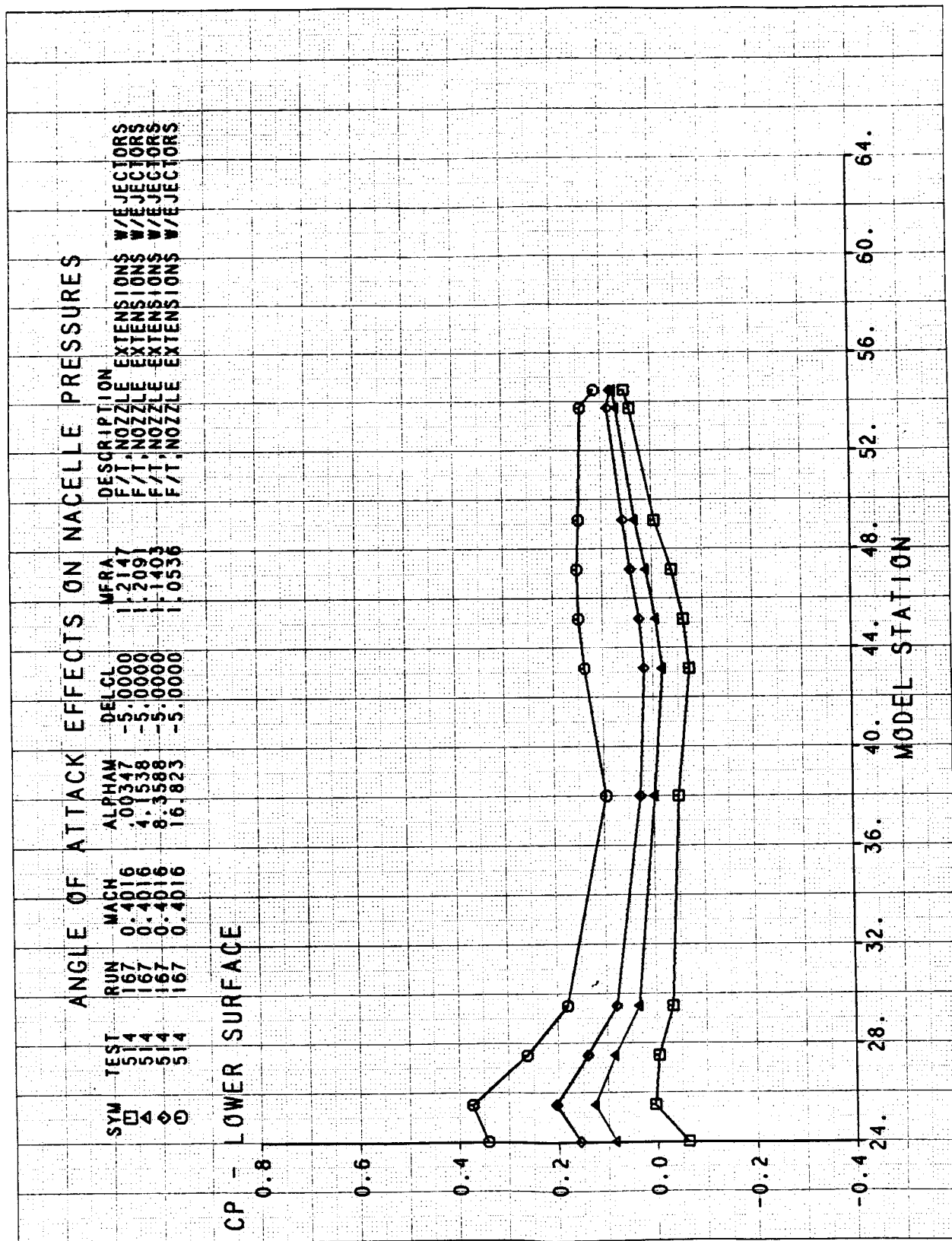
CP - UPPER SURFACE

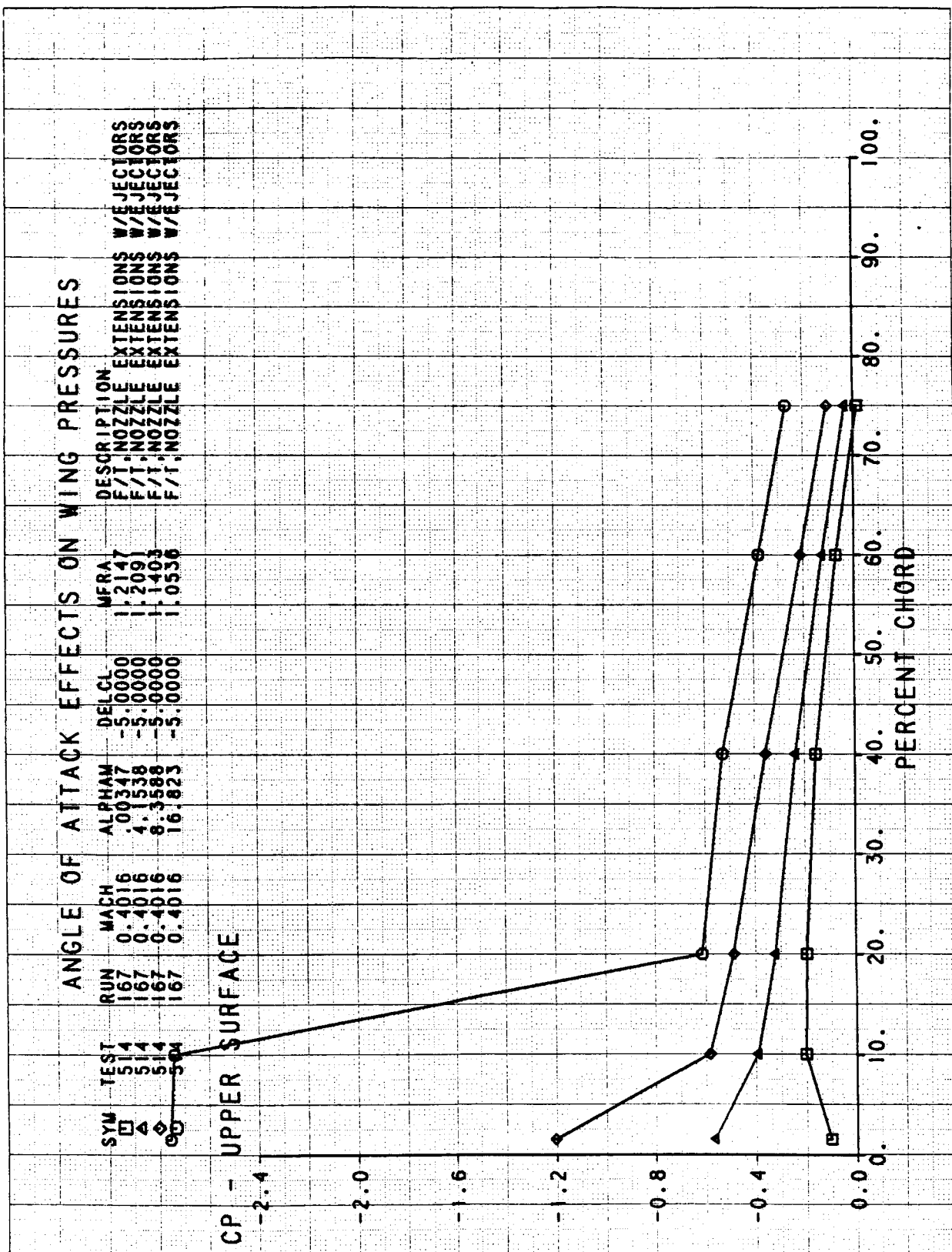


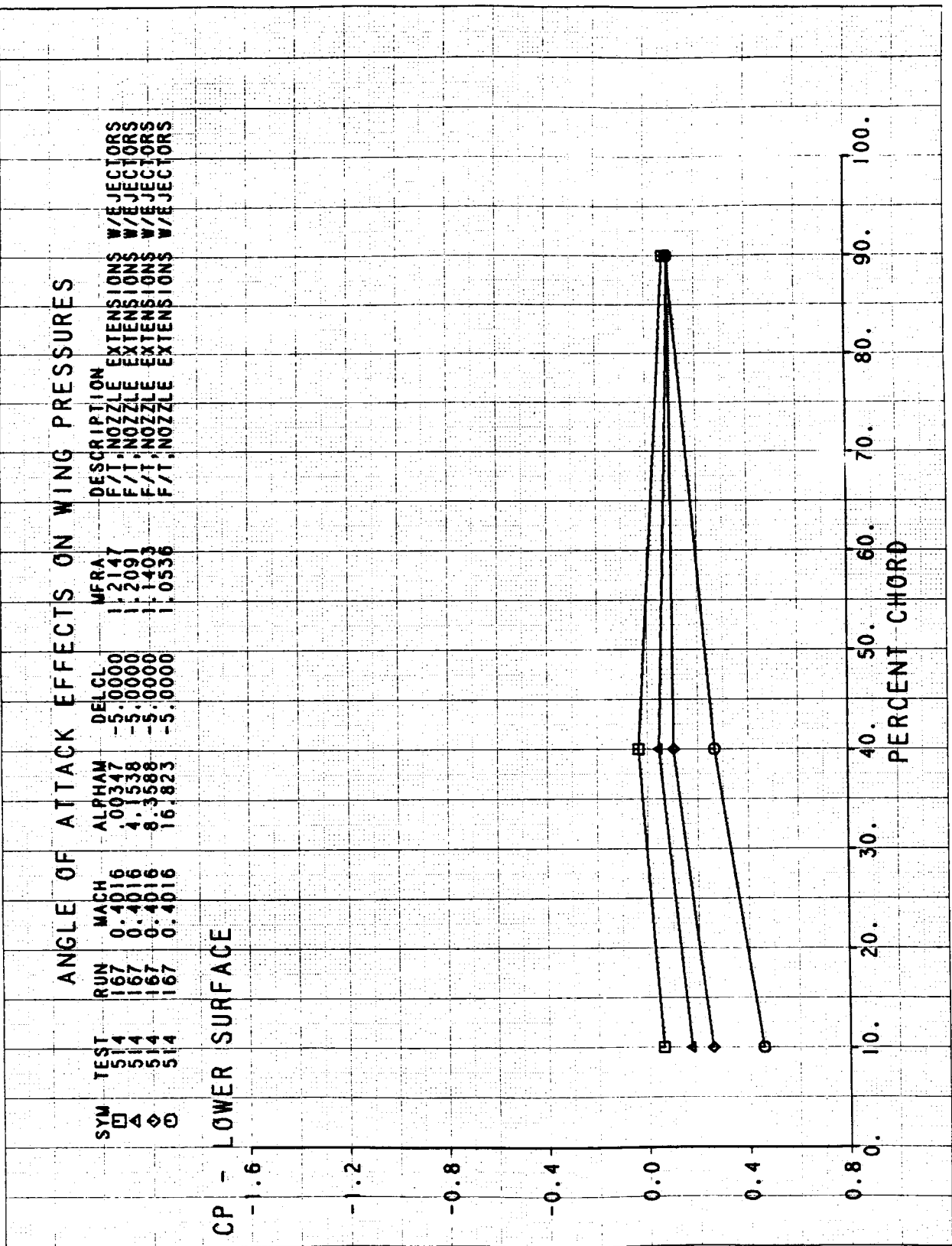


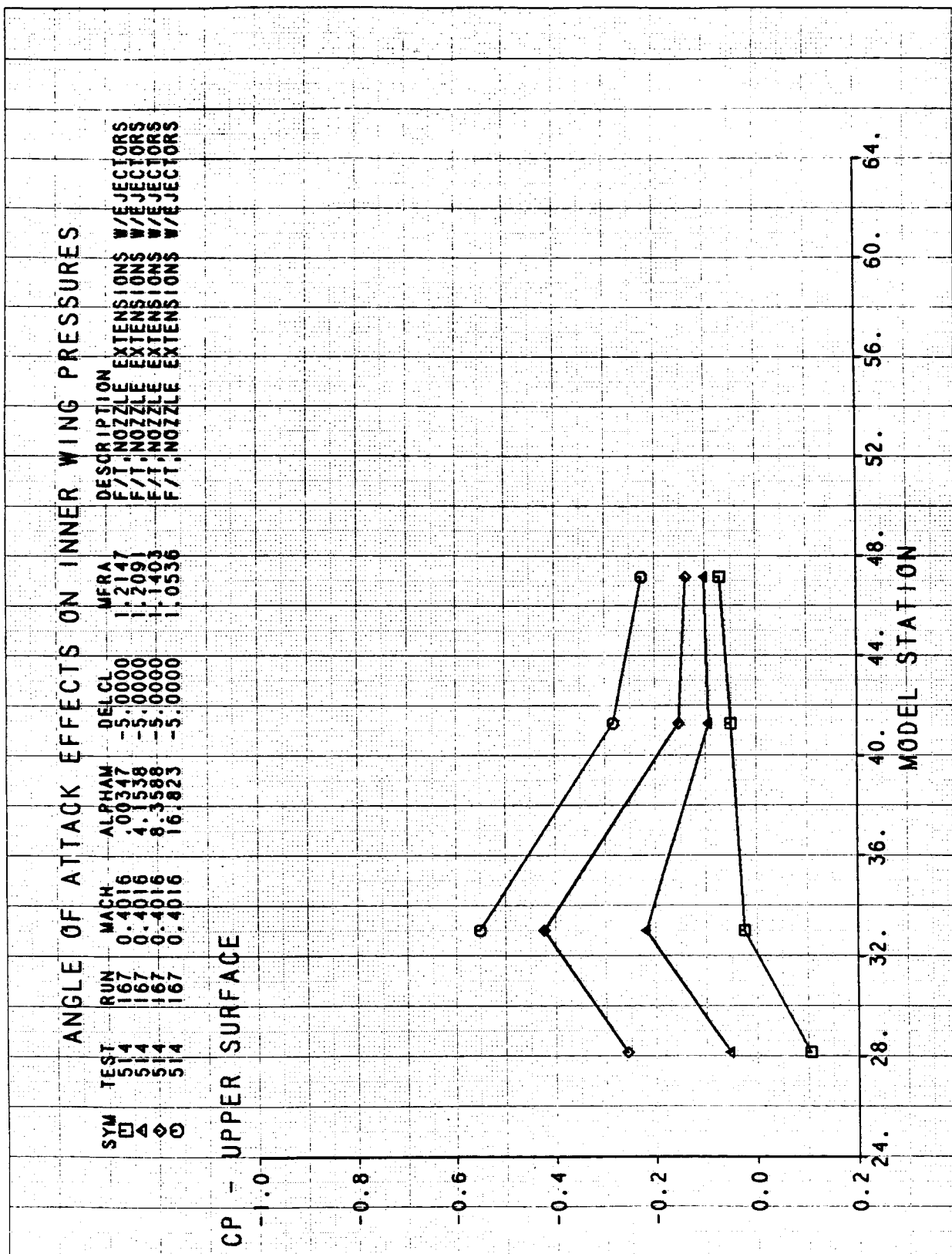


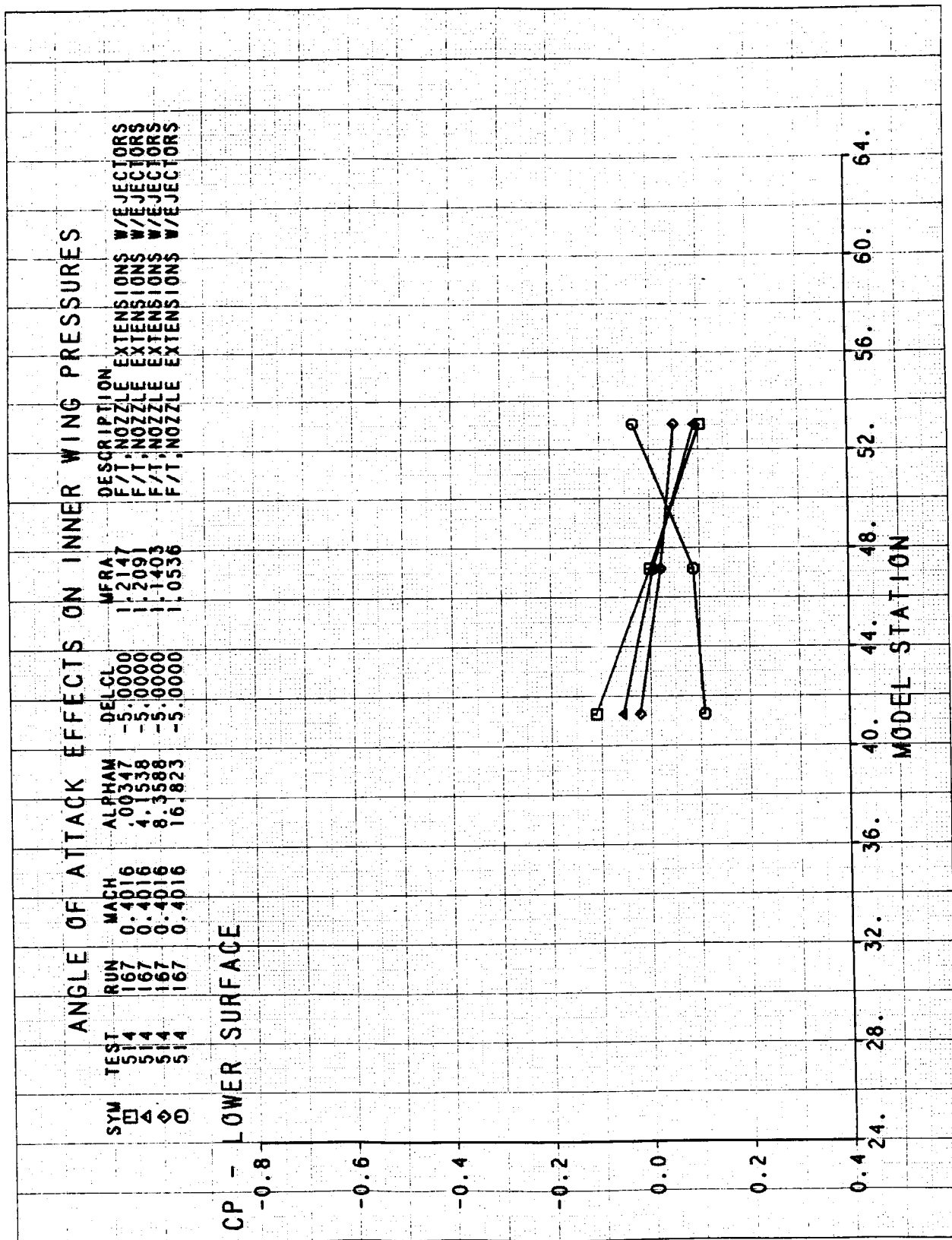


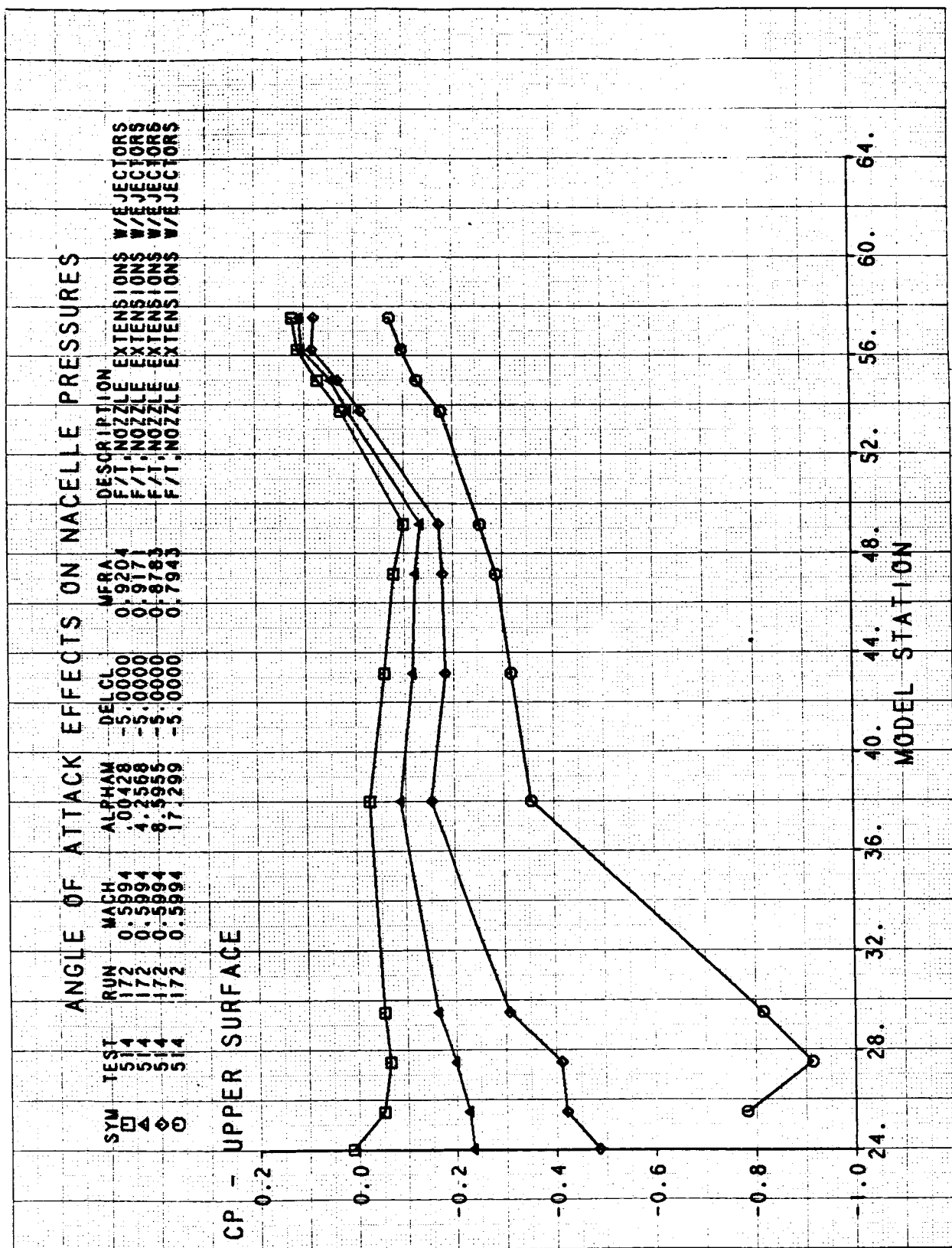




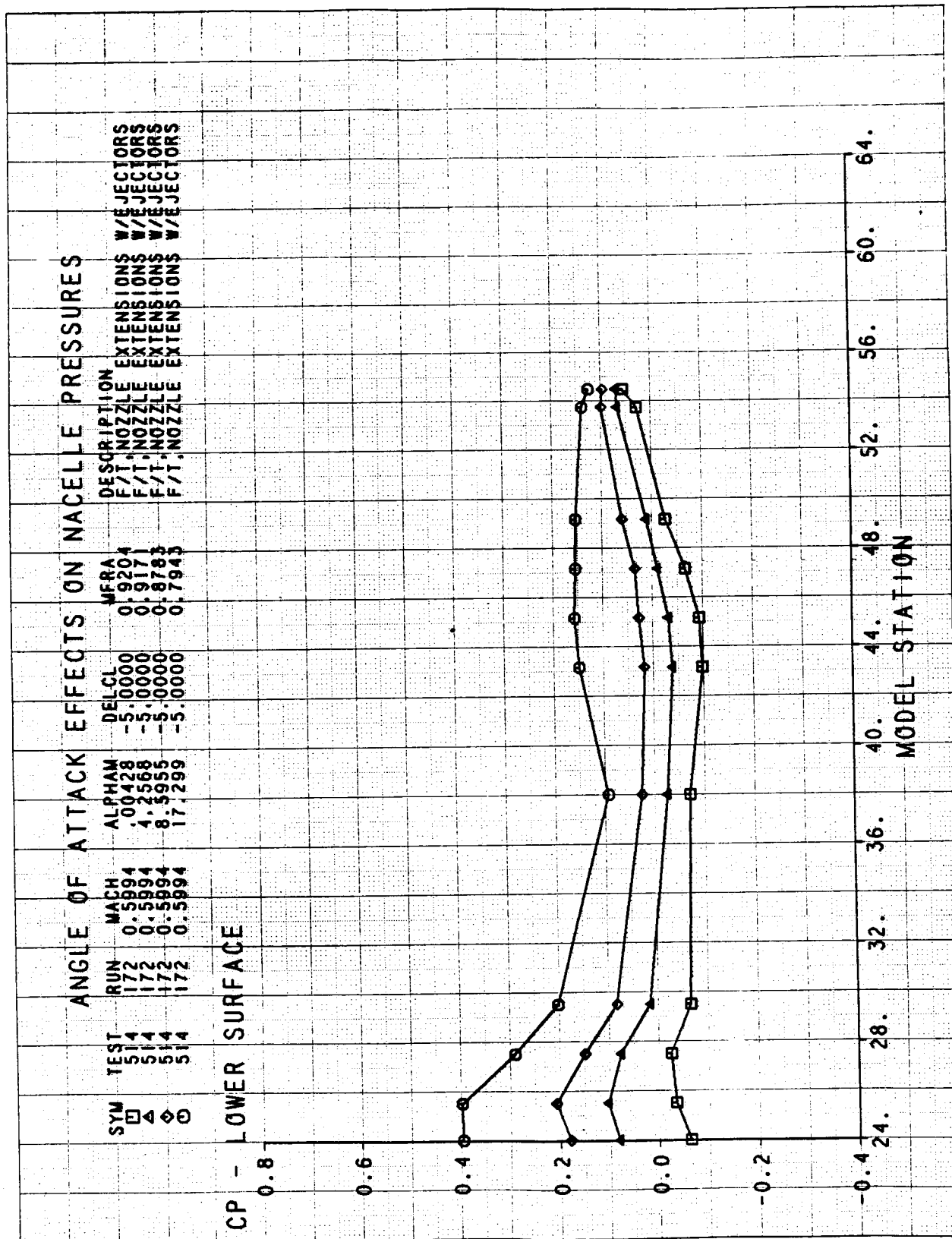


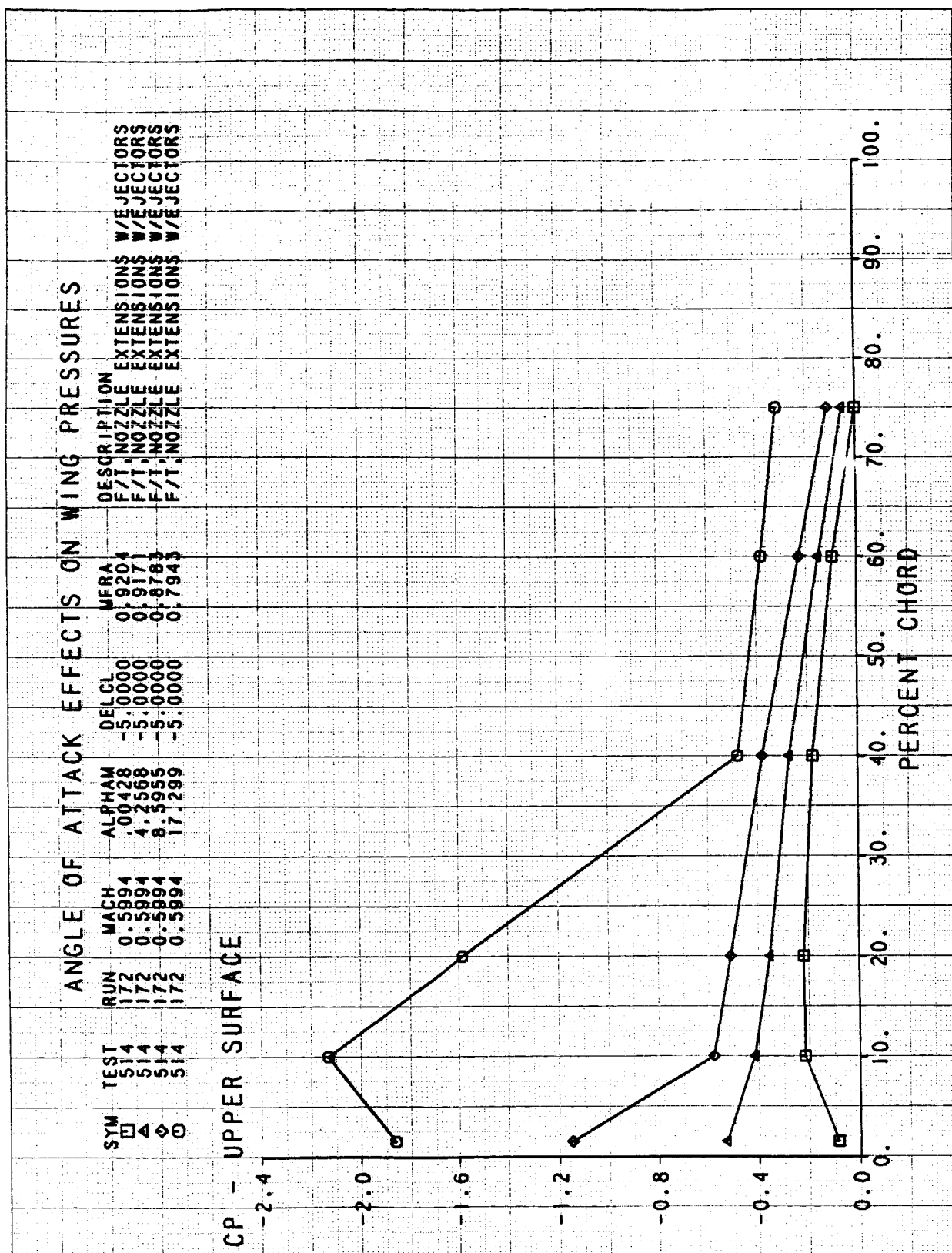


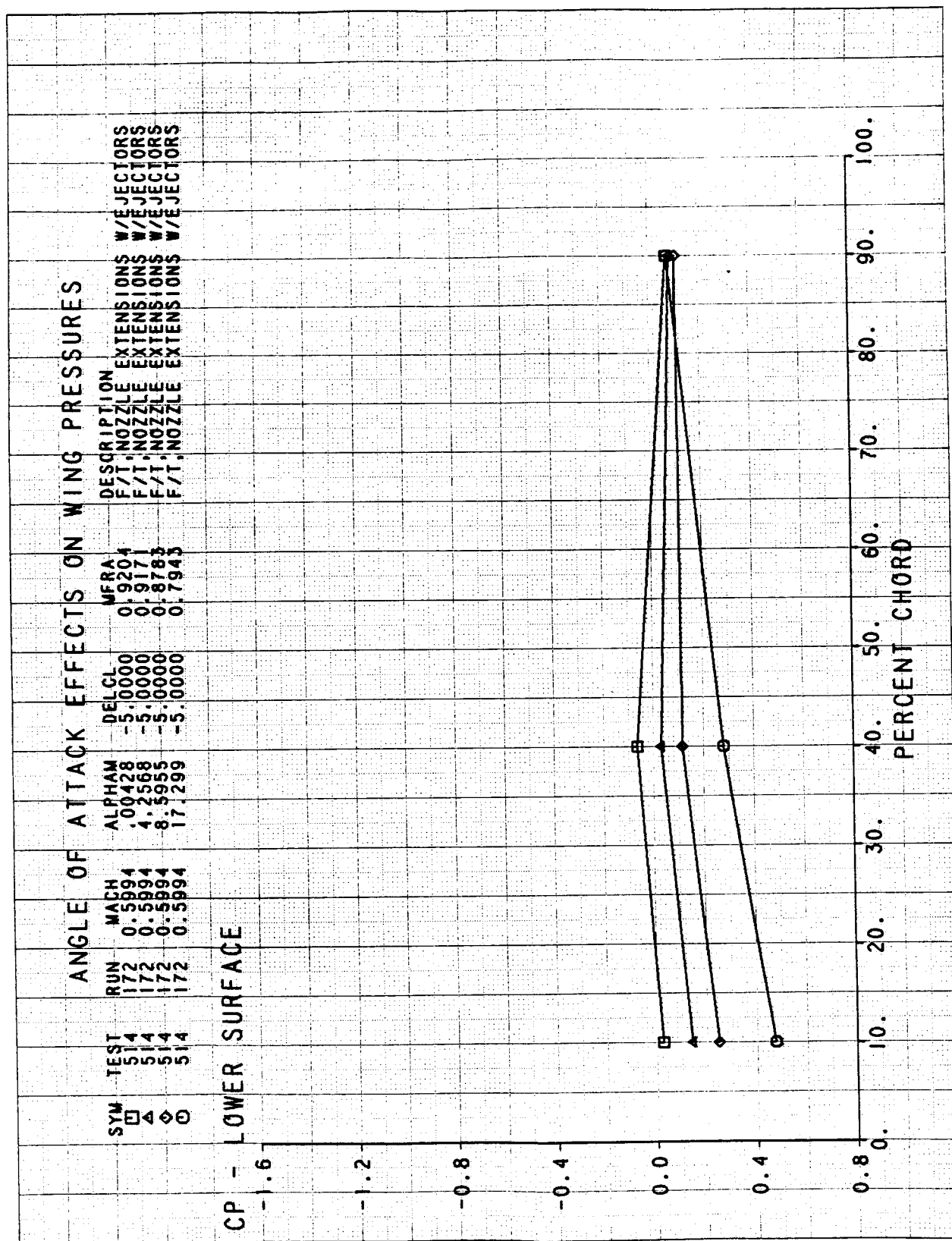


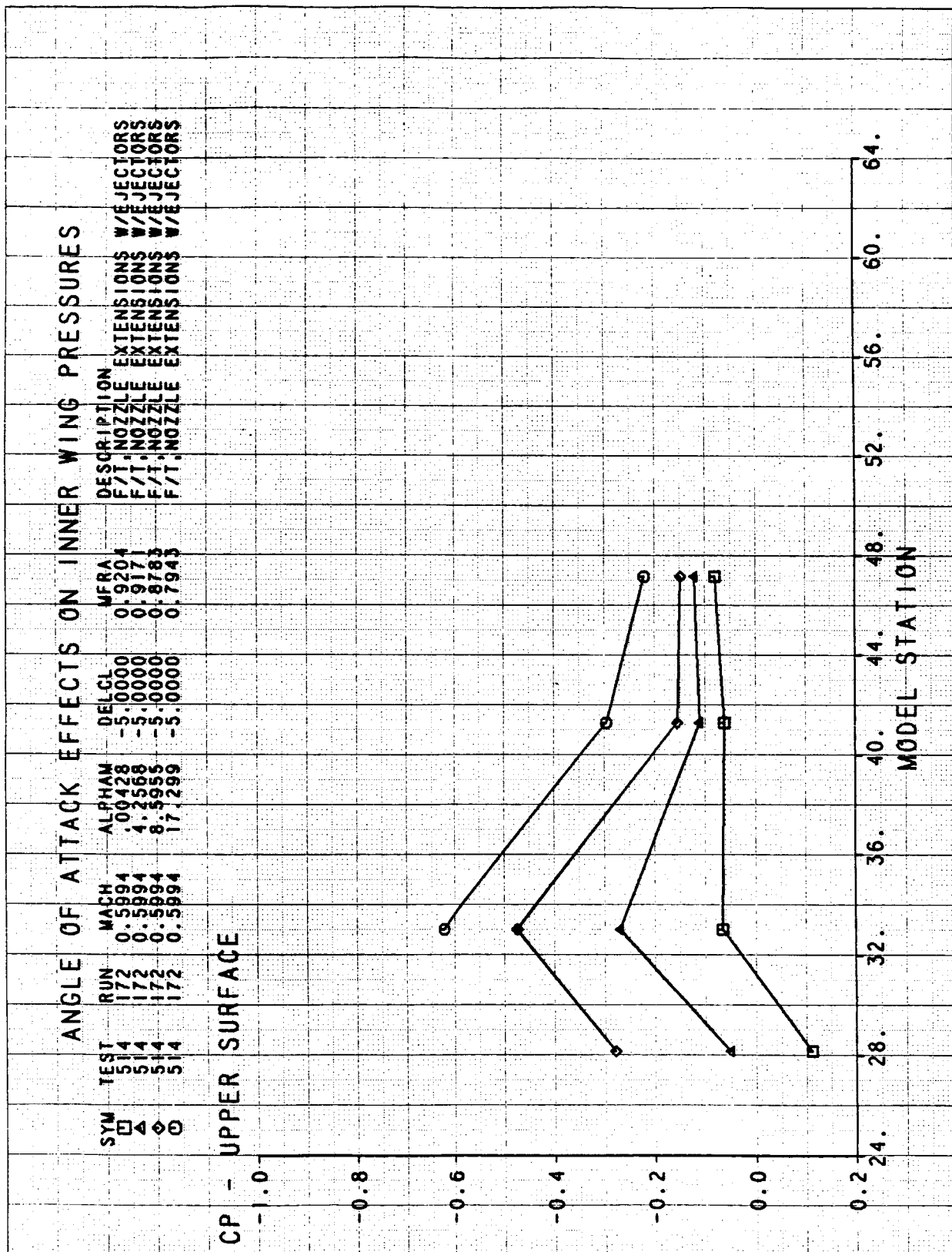


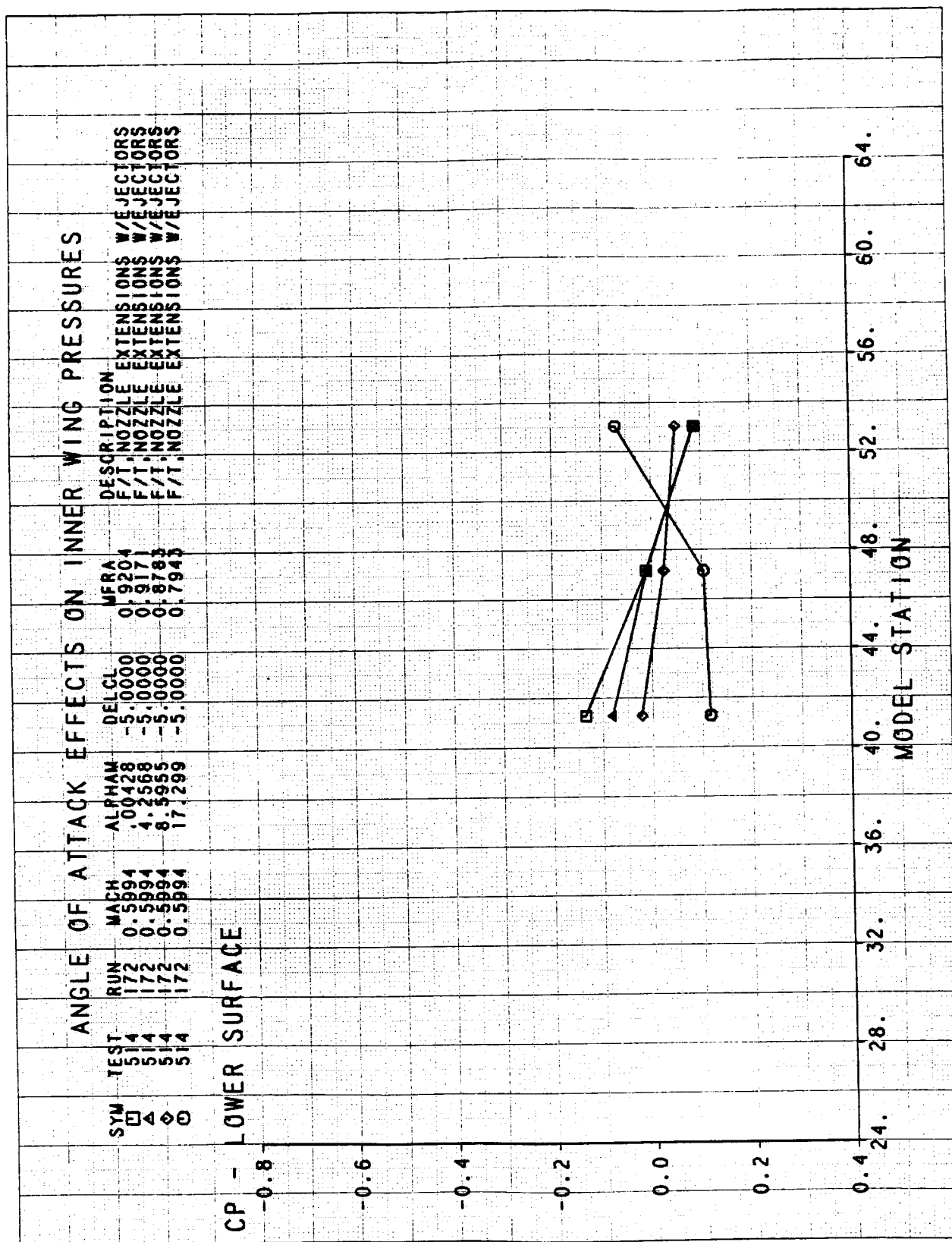


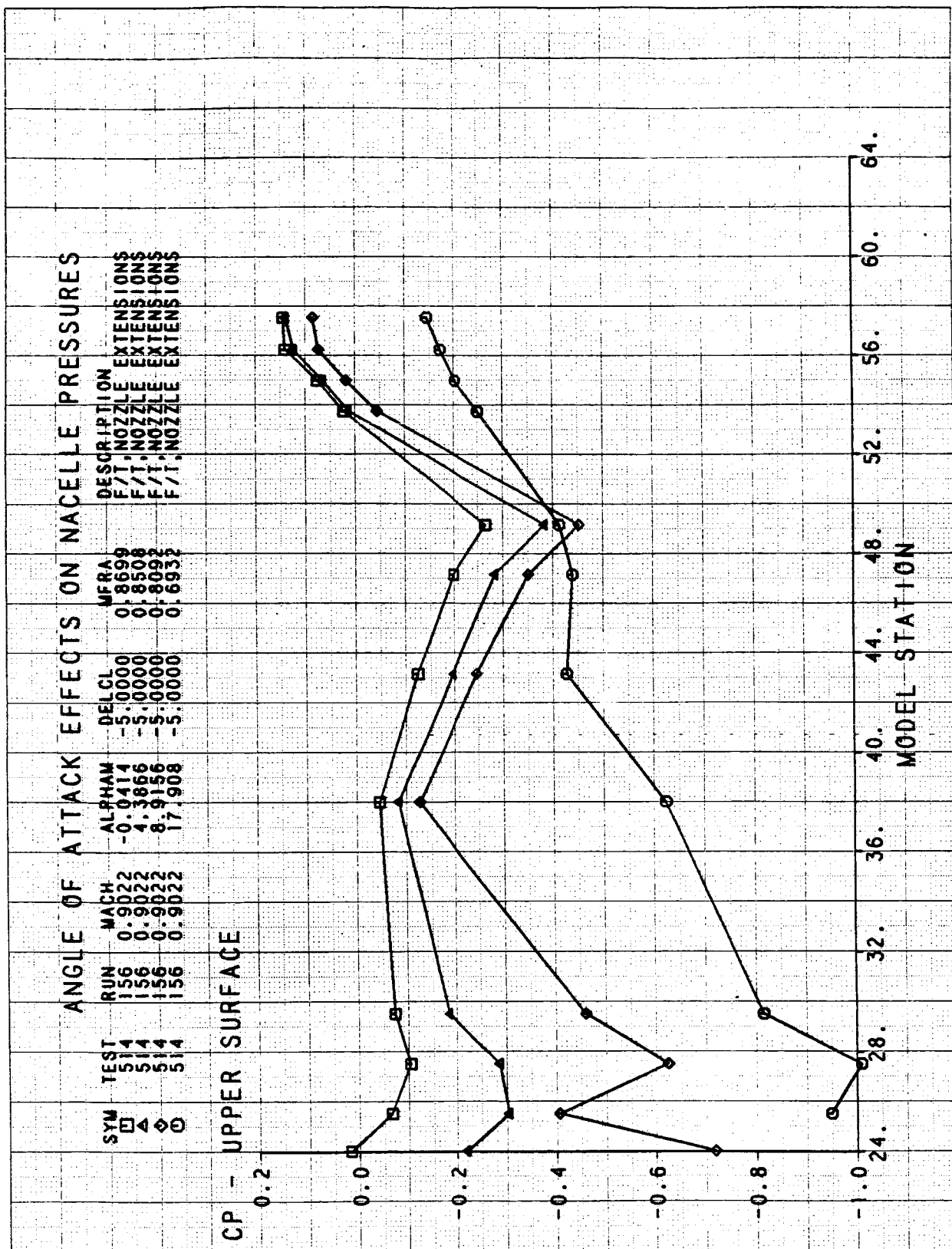


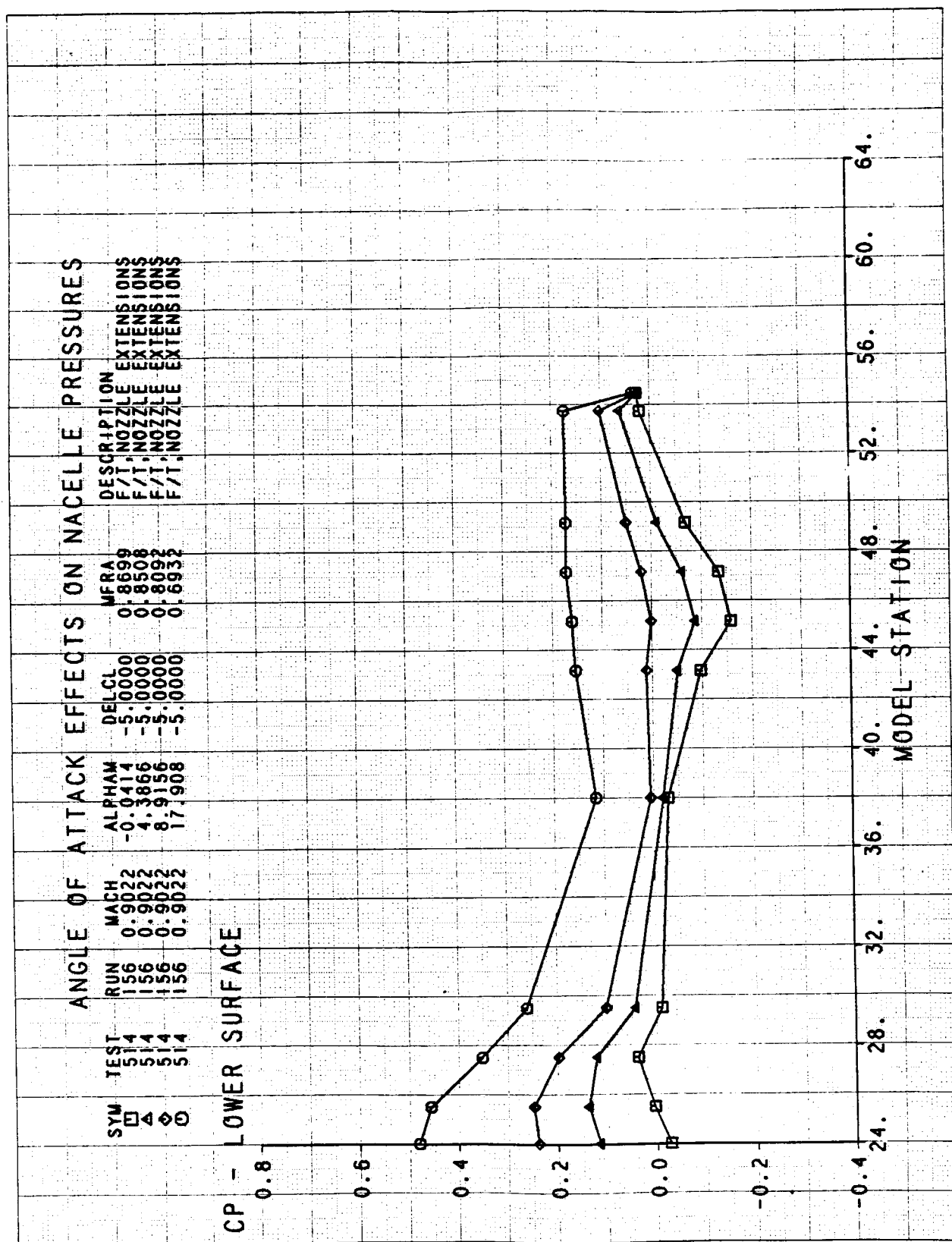


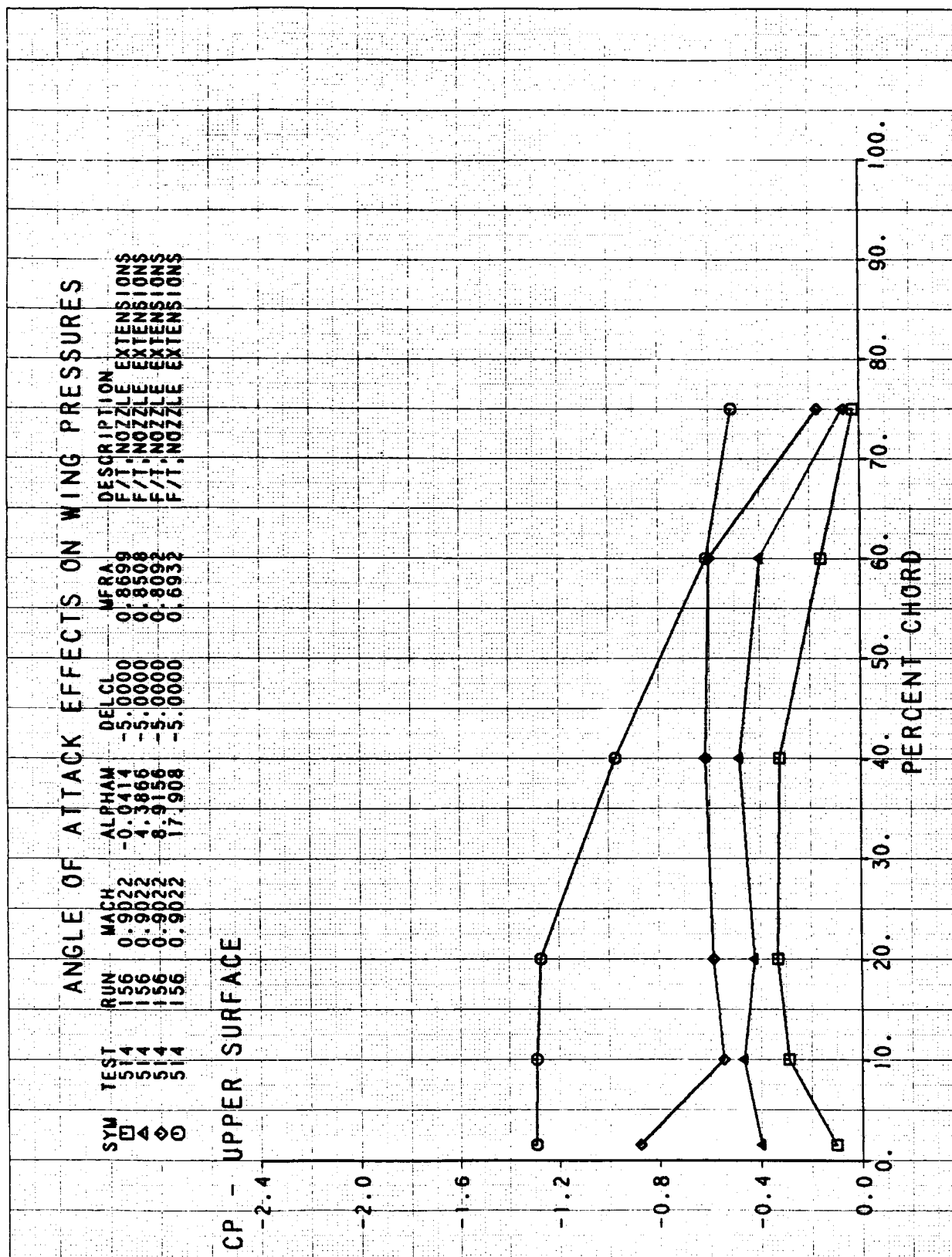




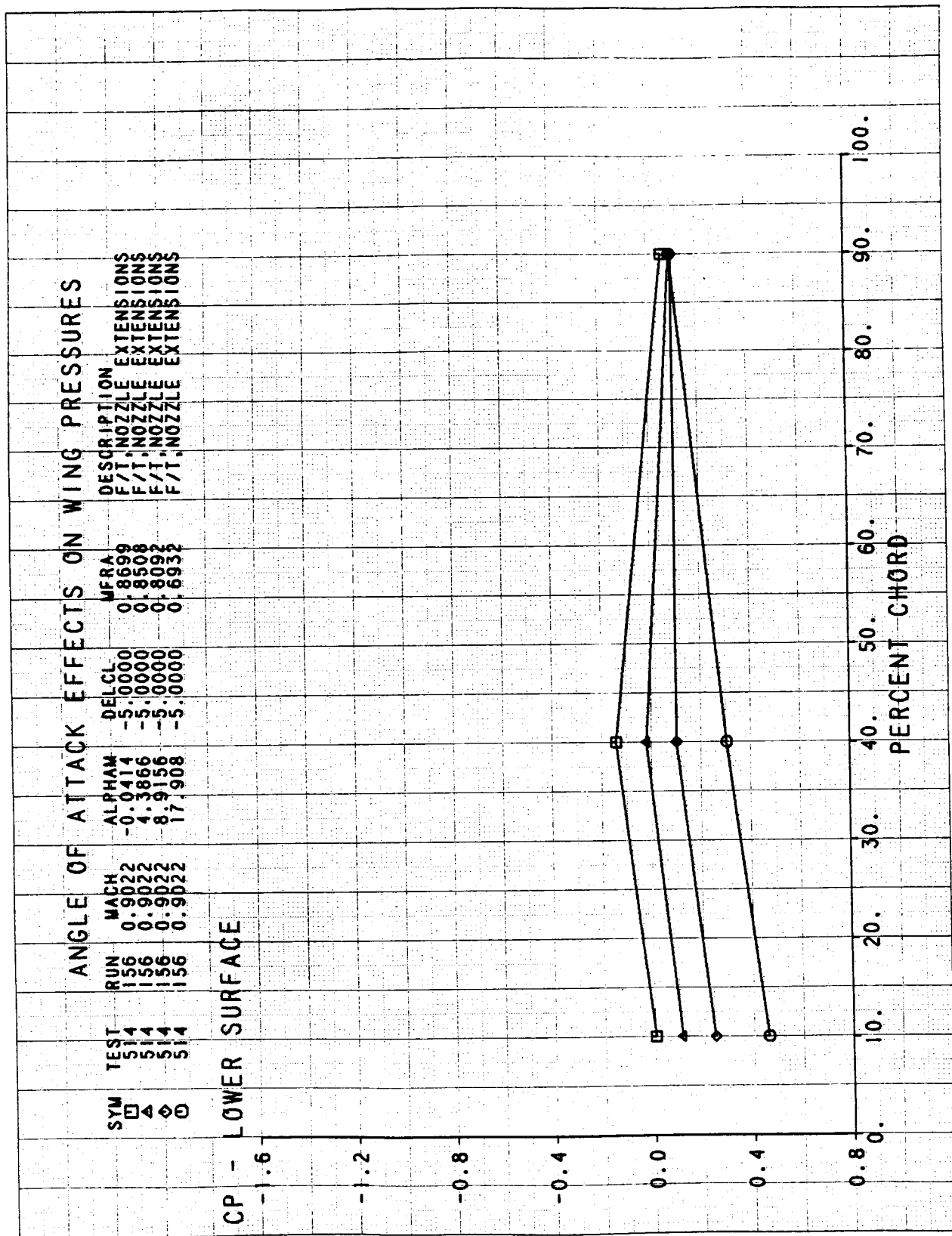


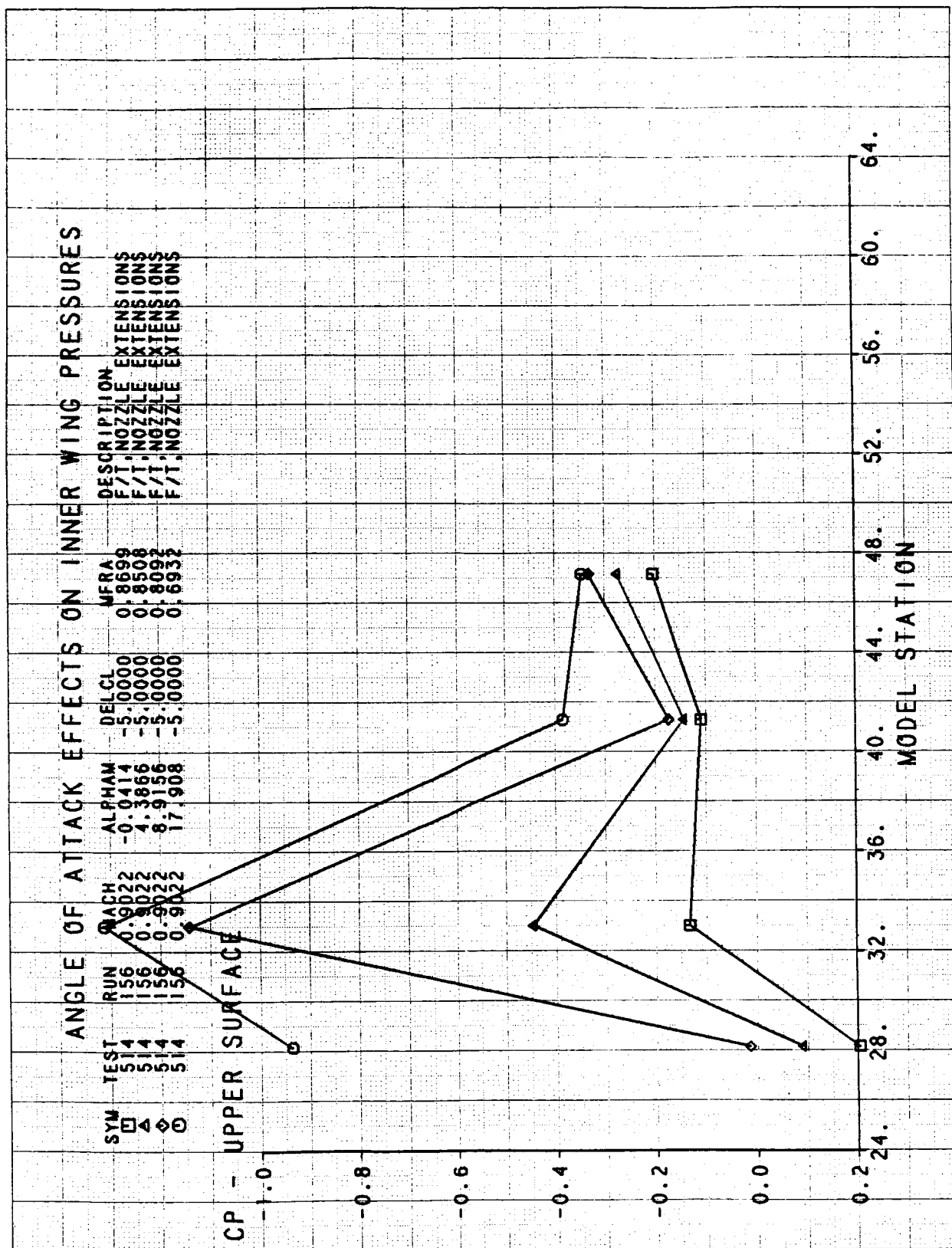


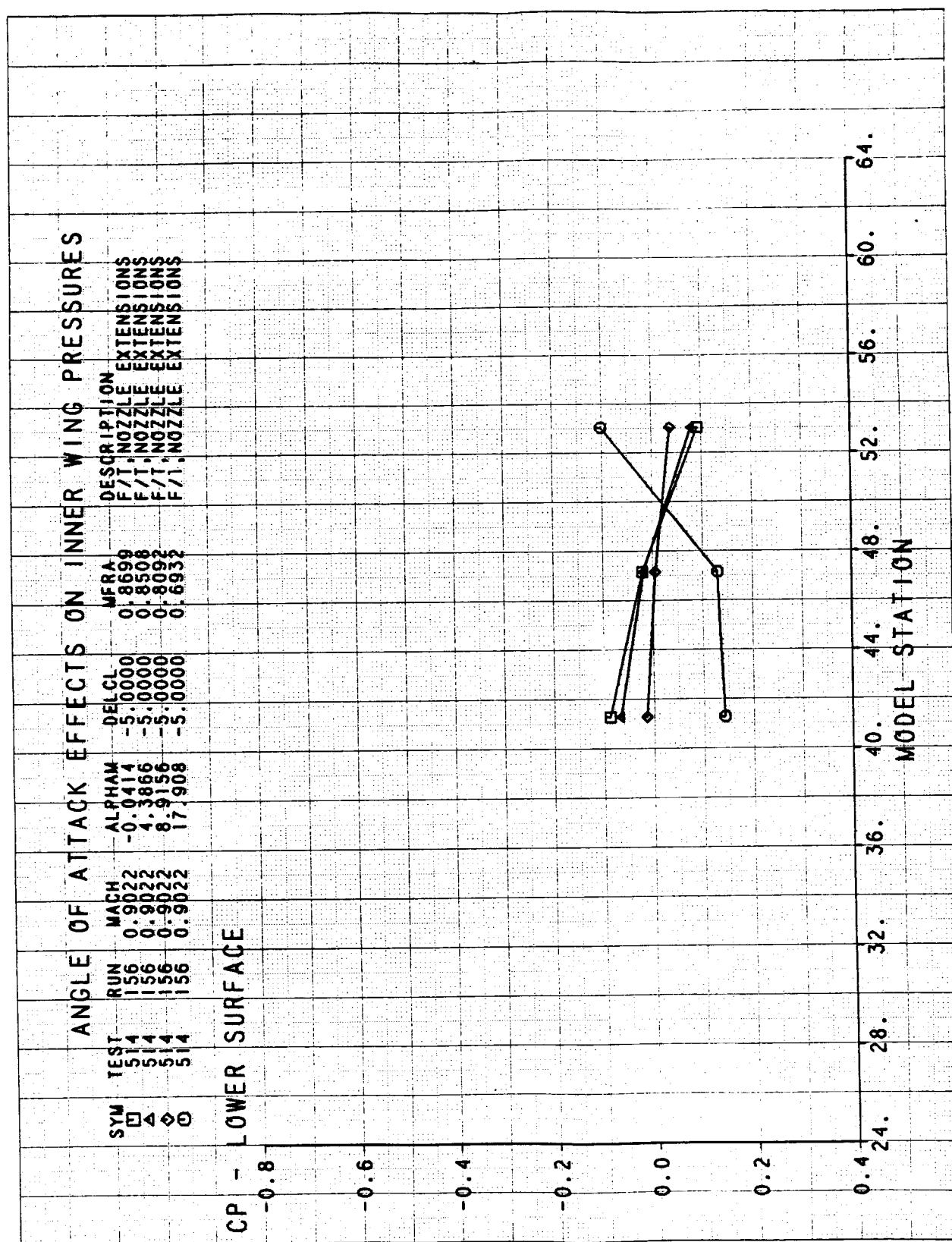


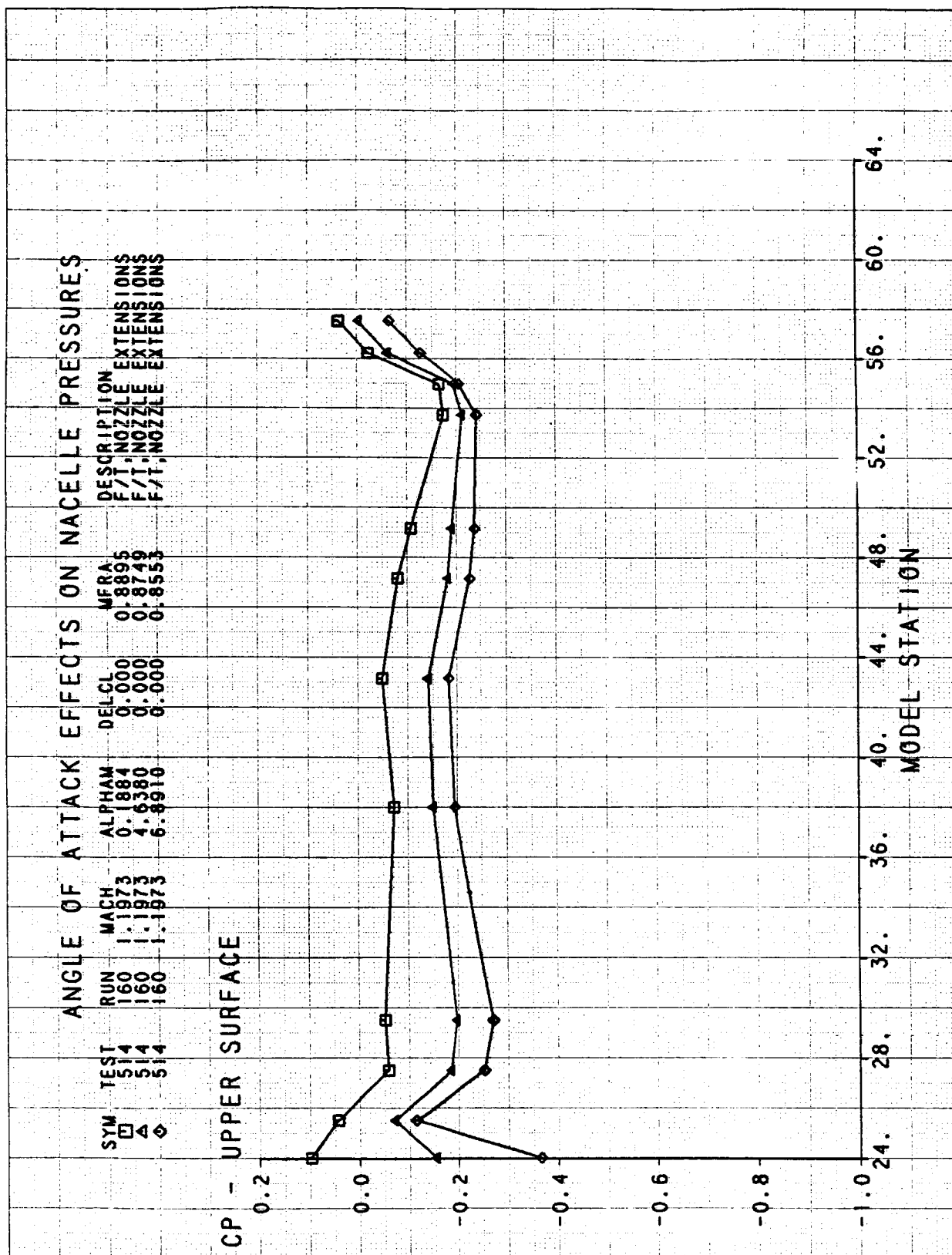


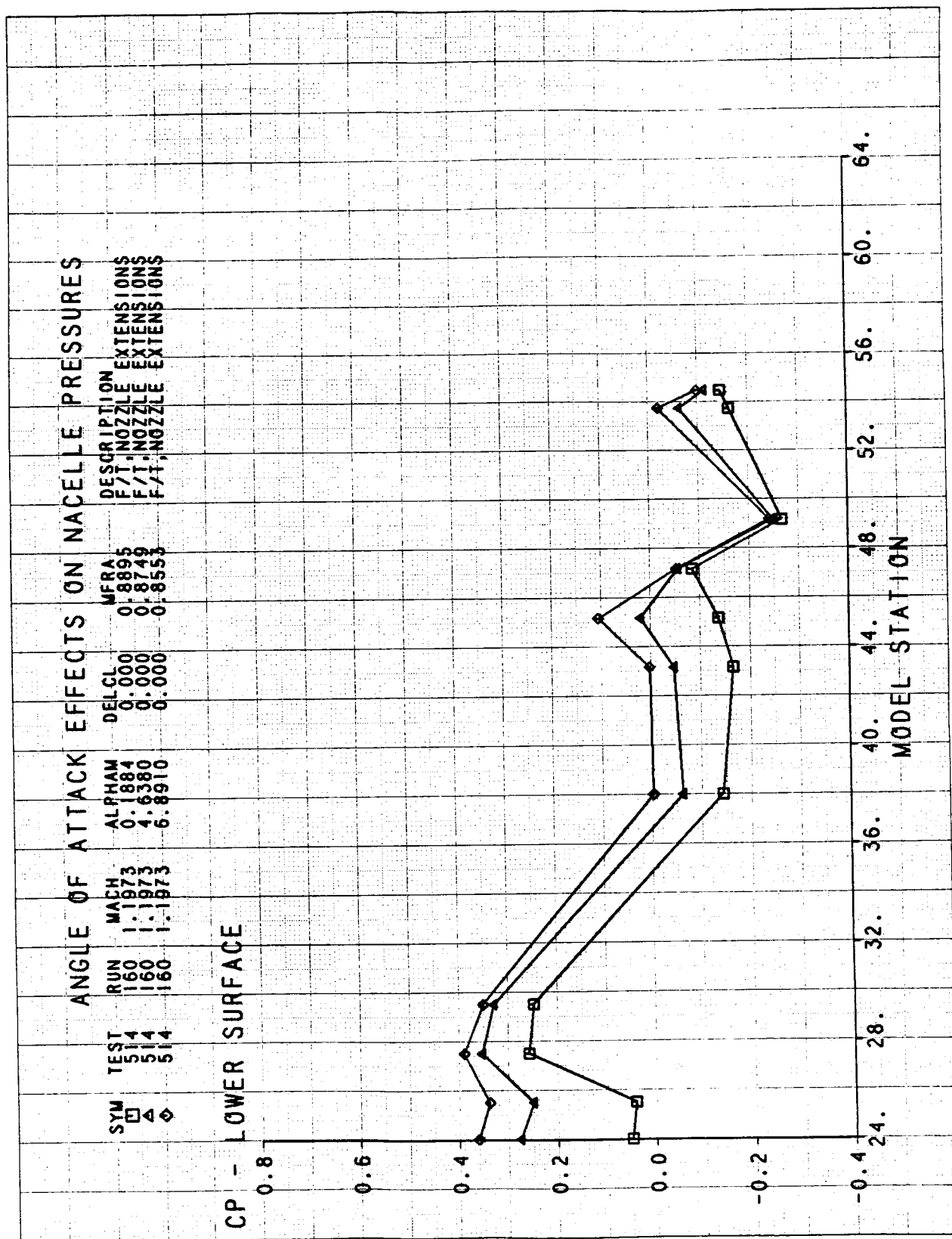


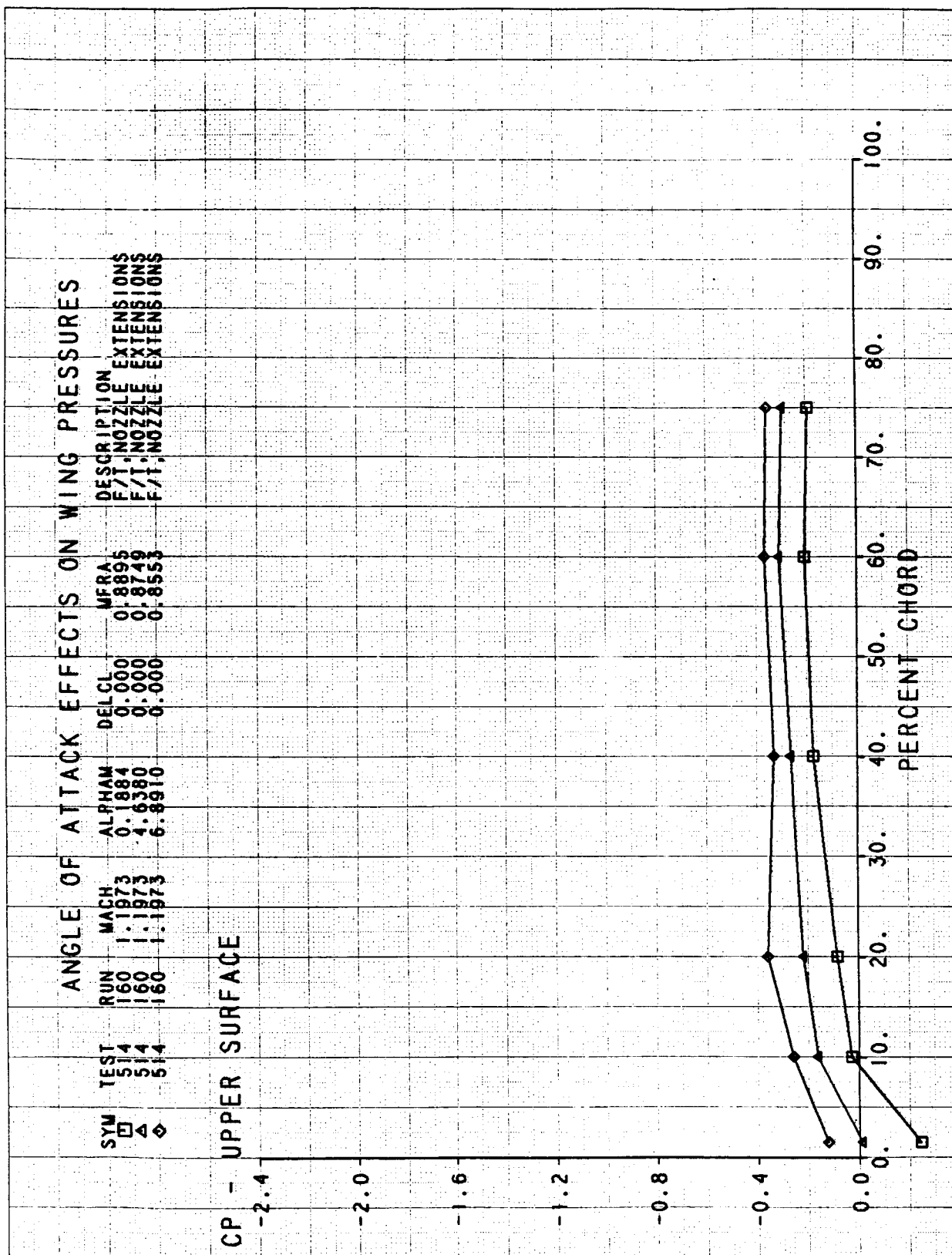


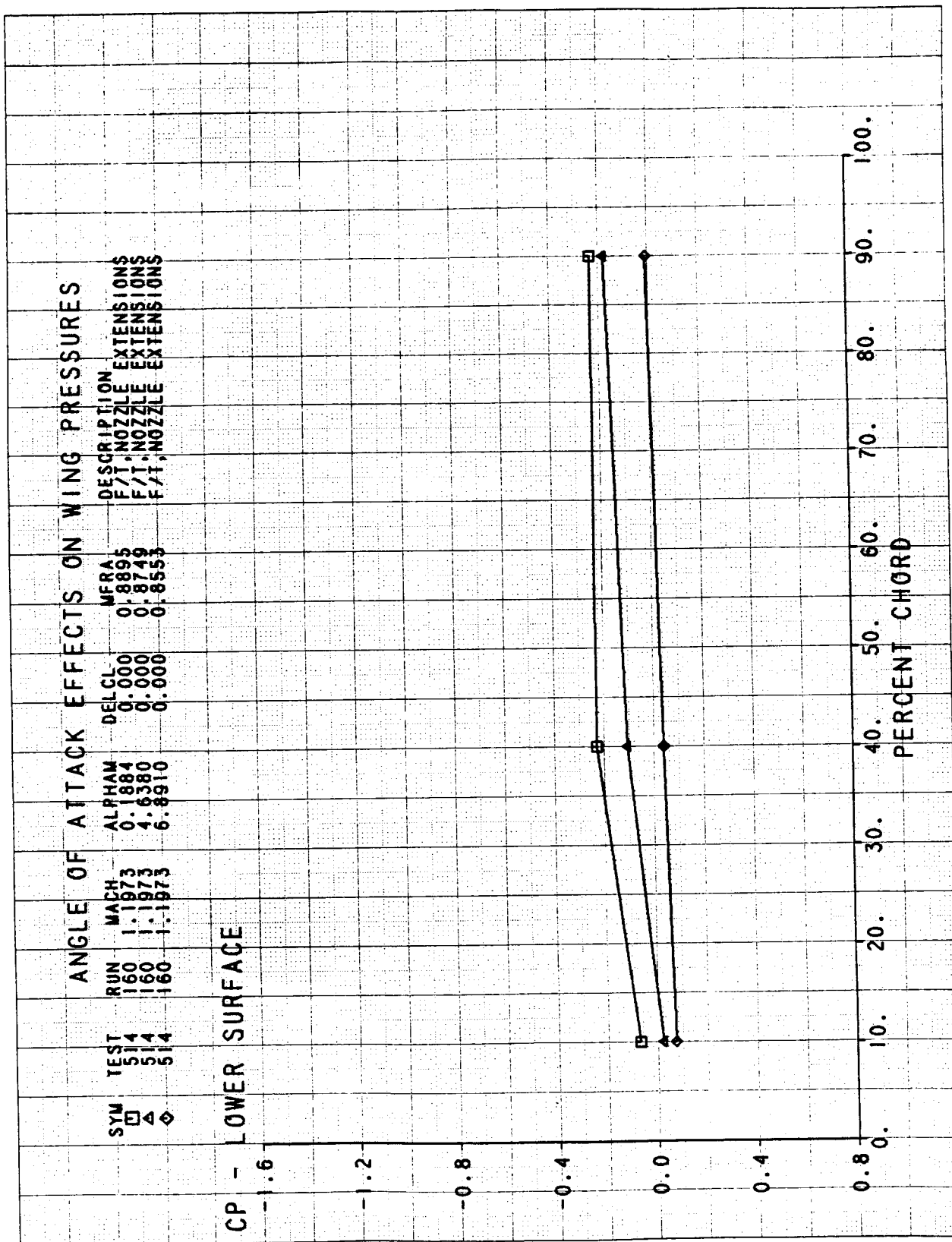


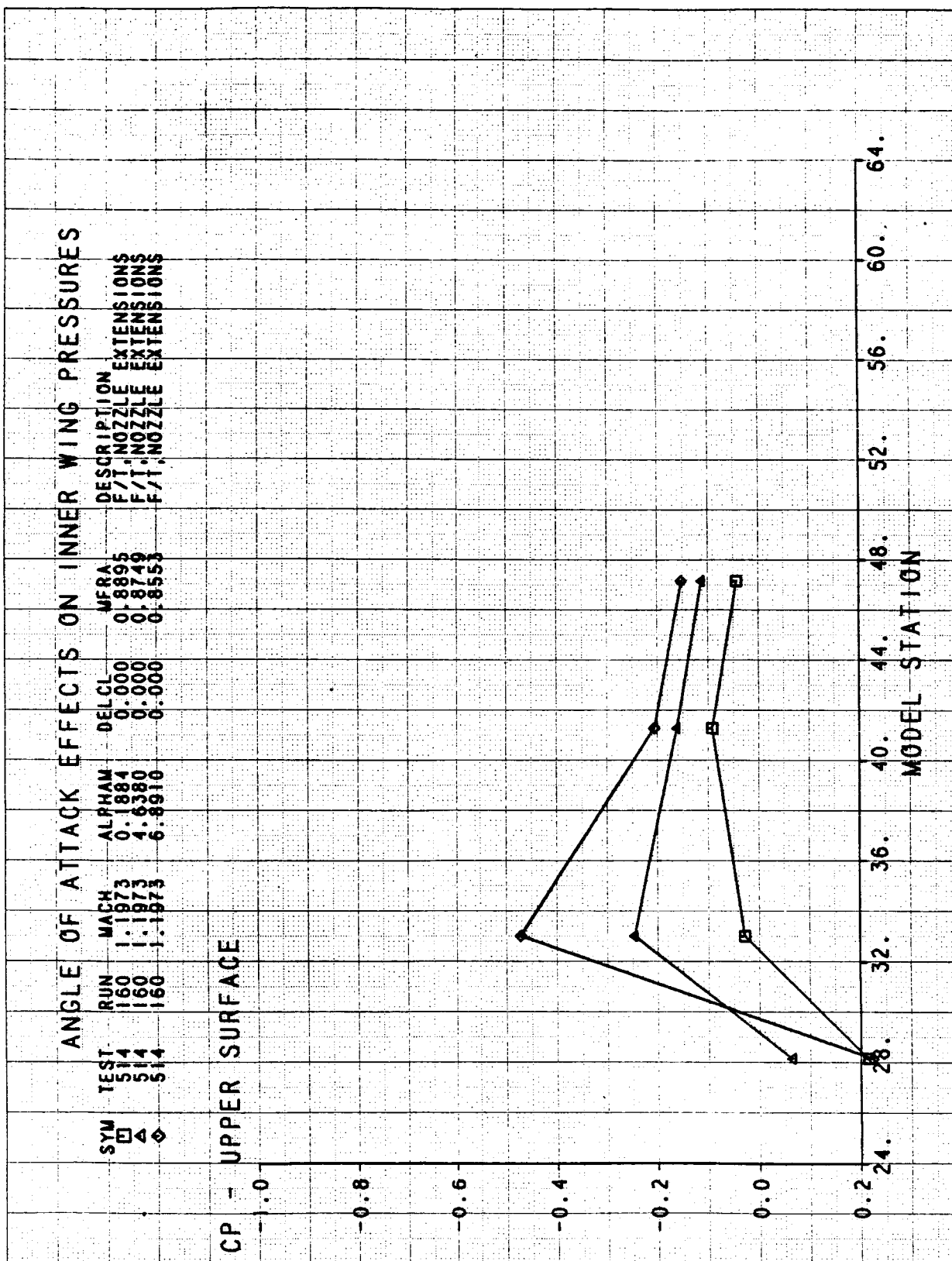




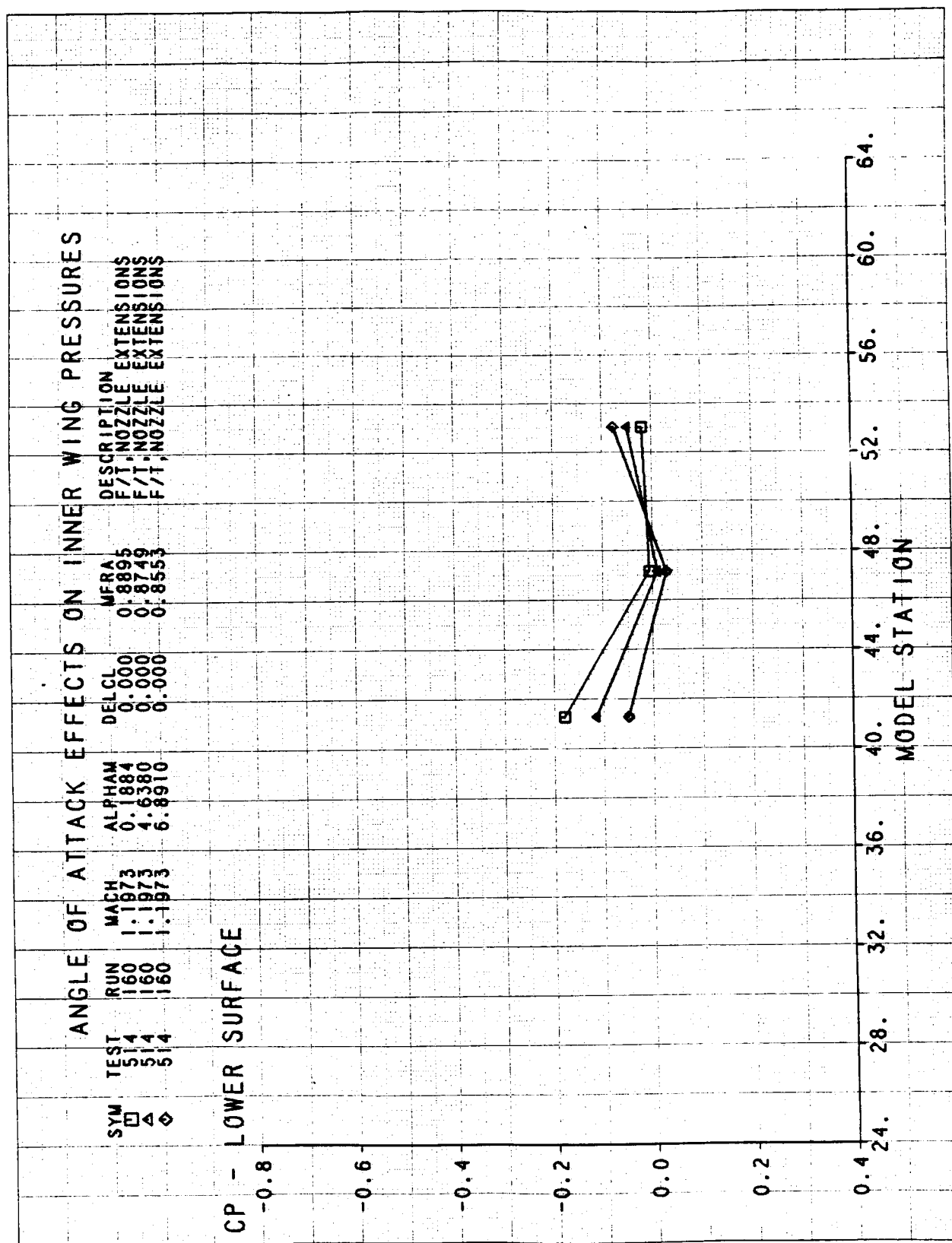


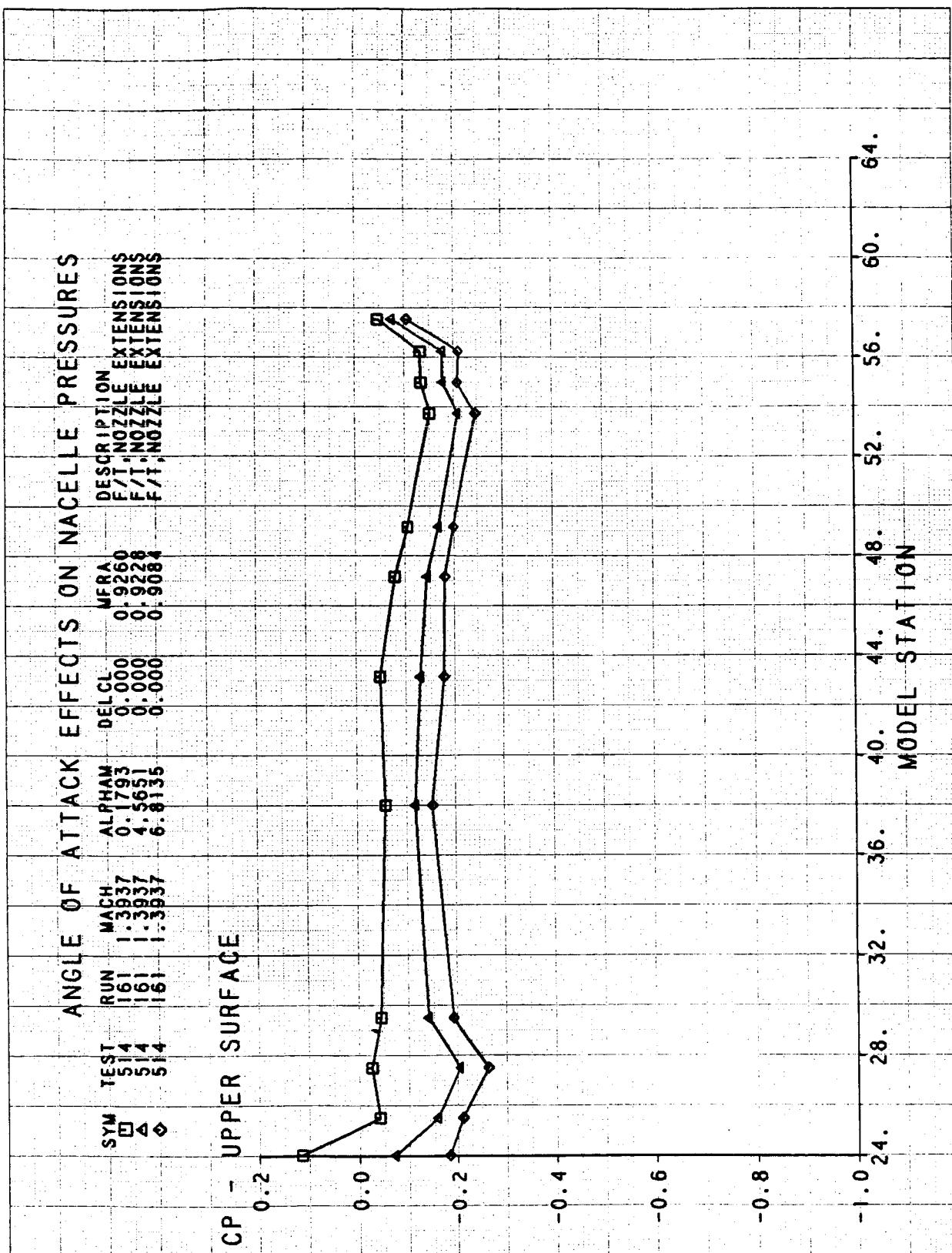


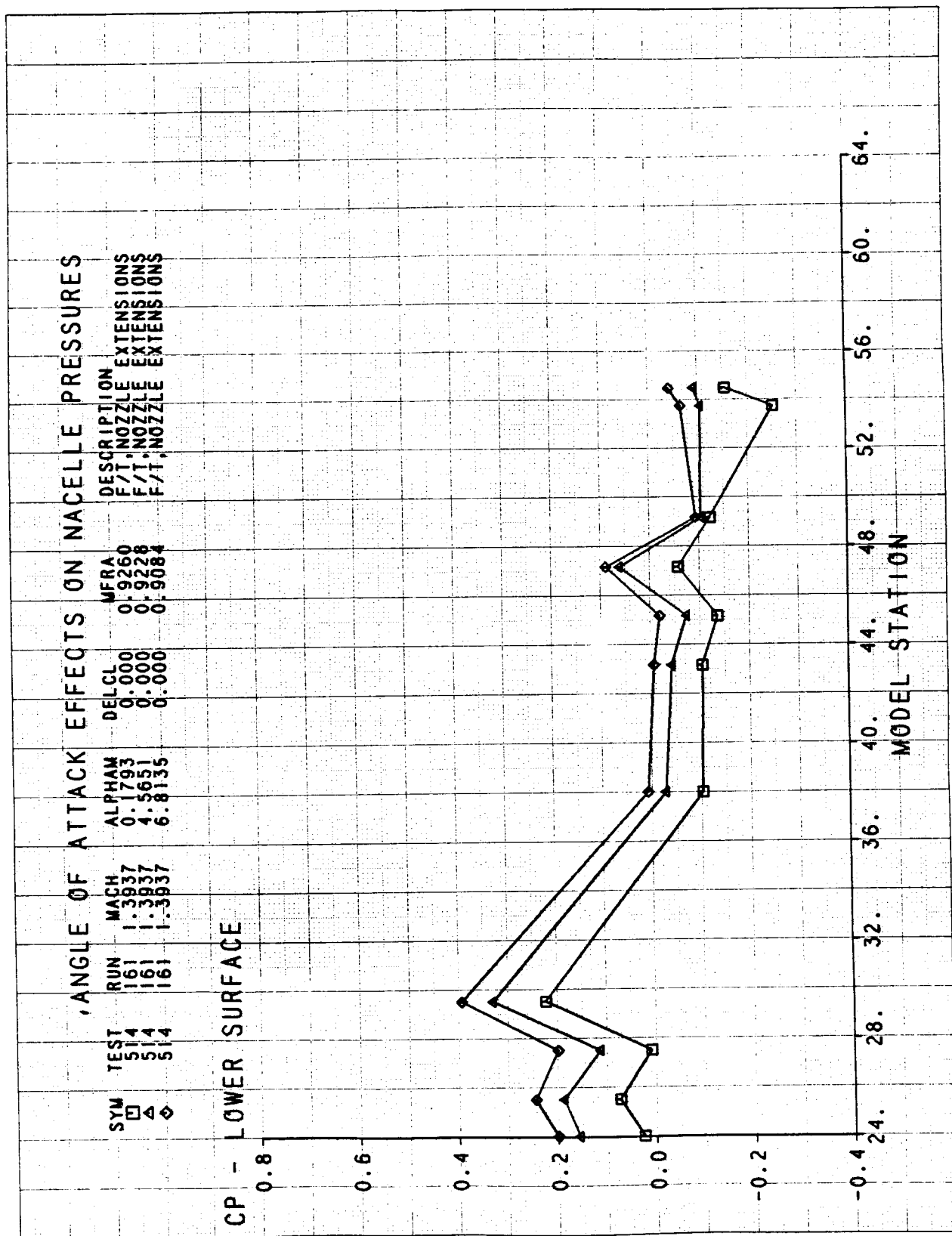


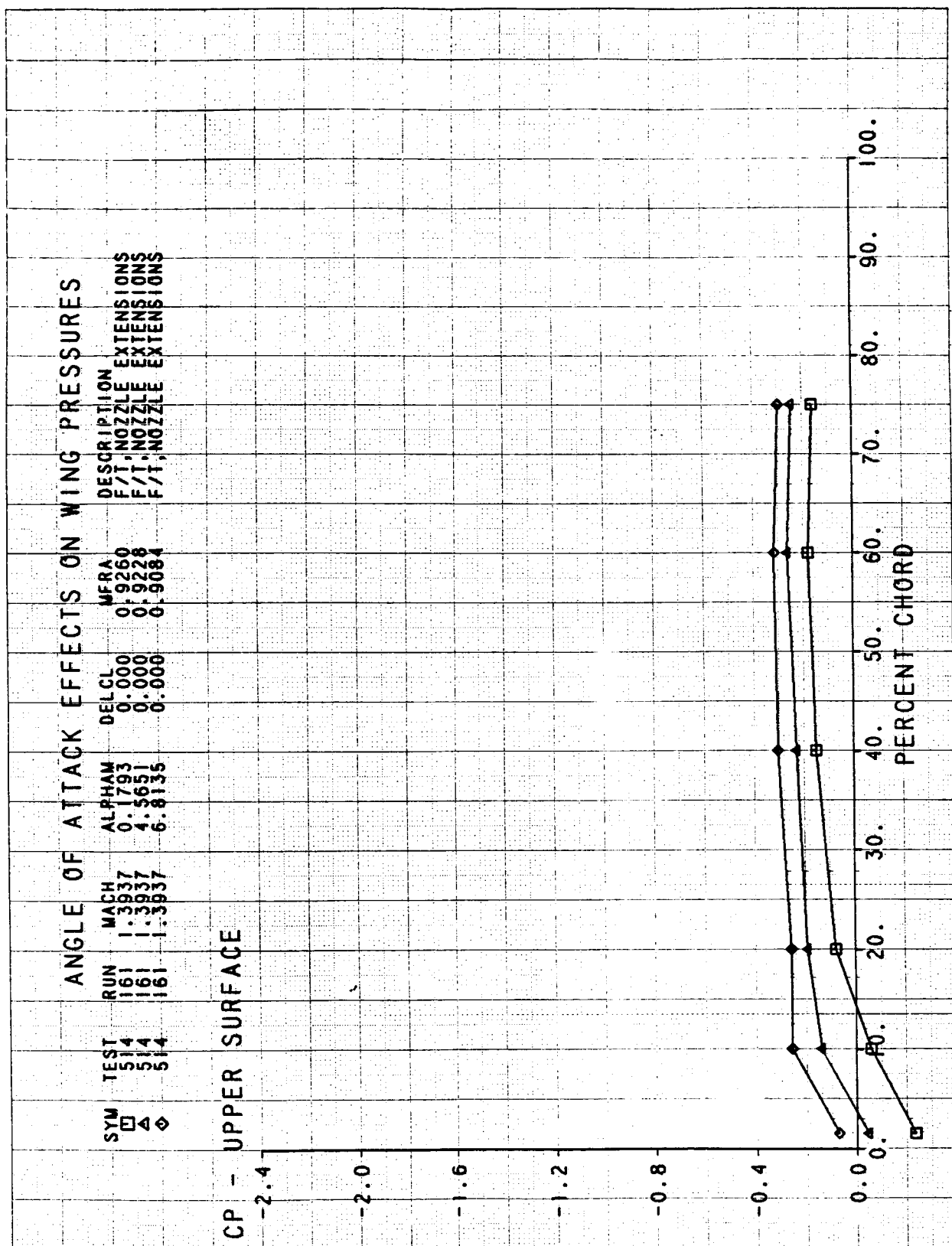


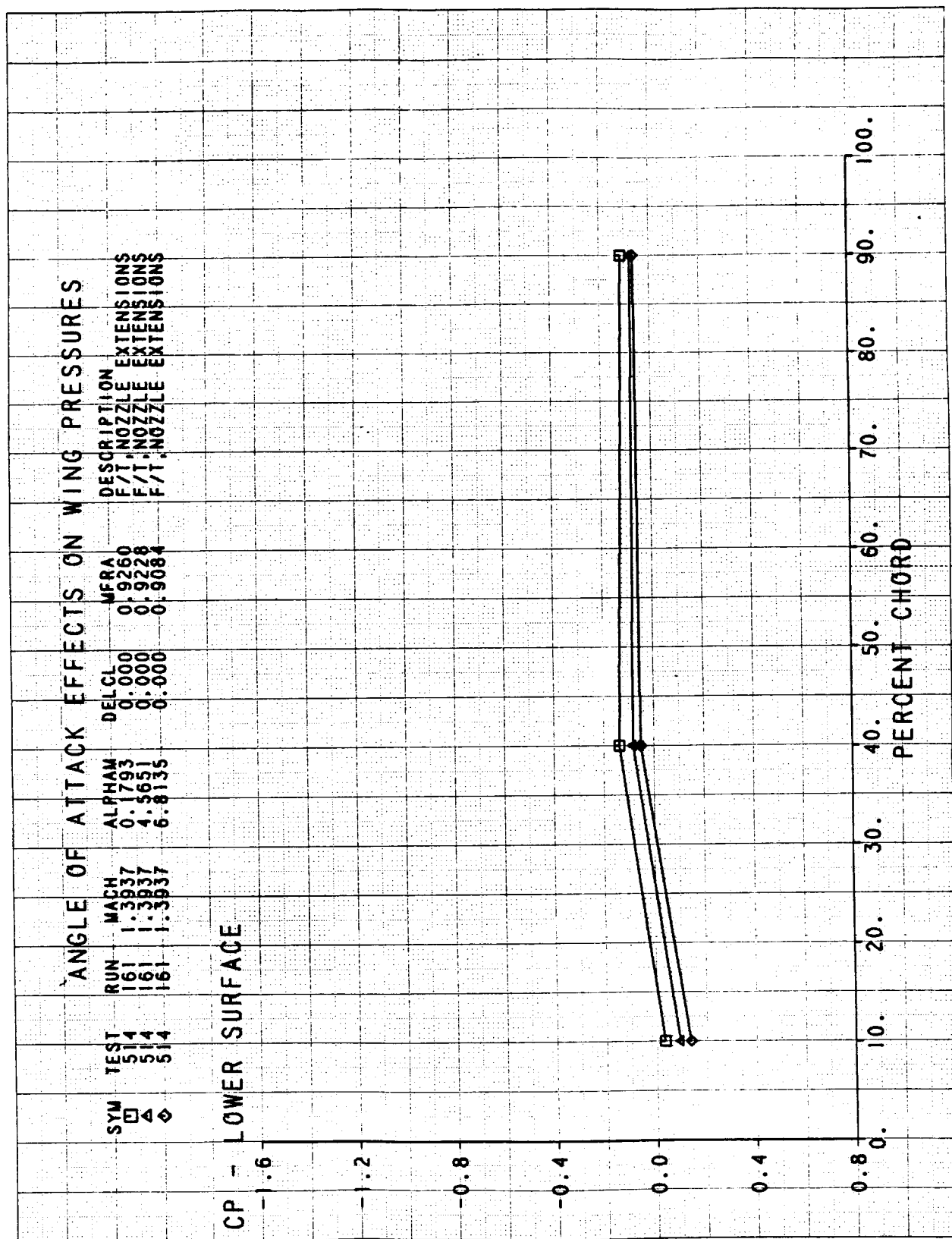


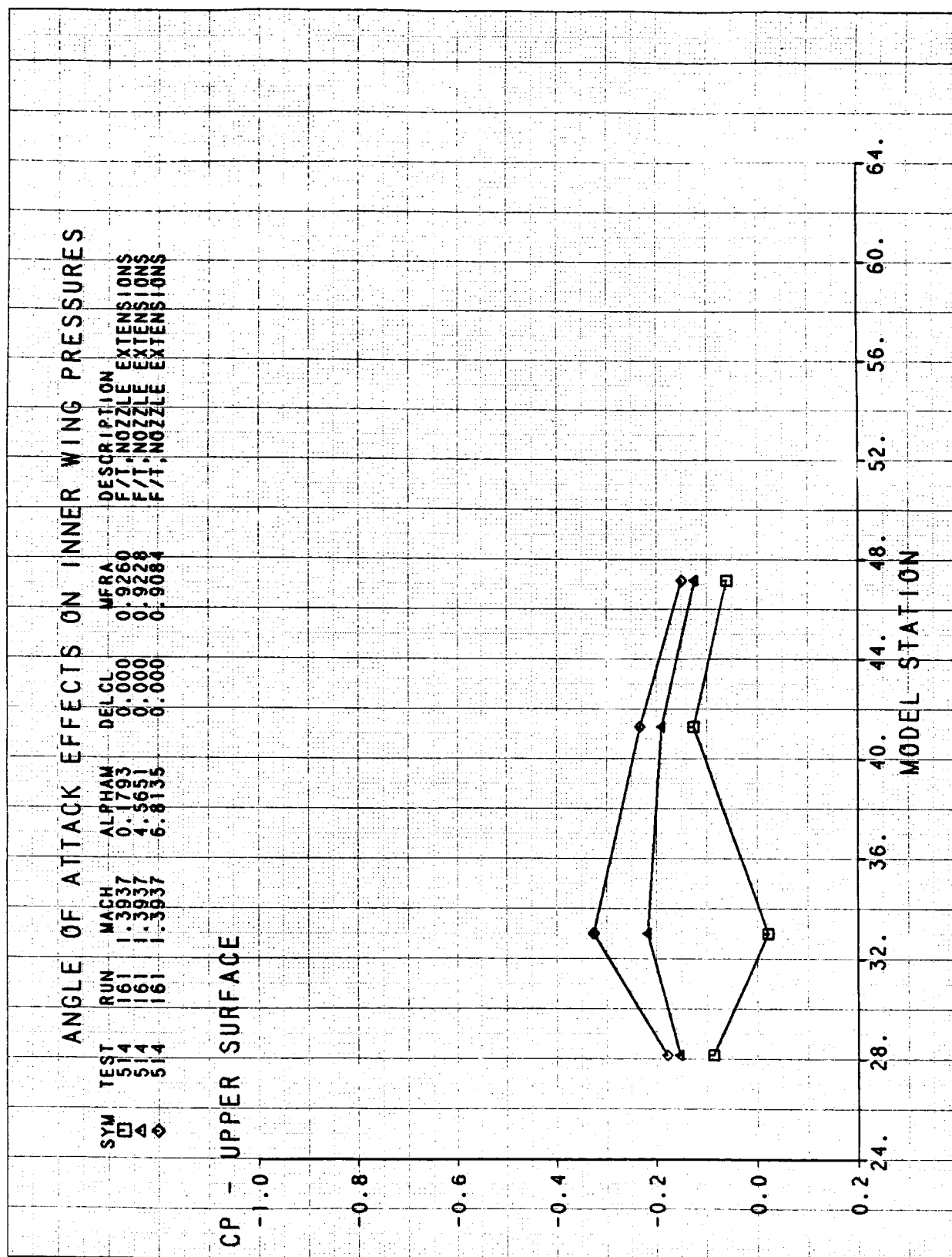


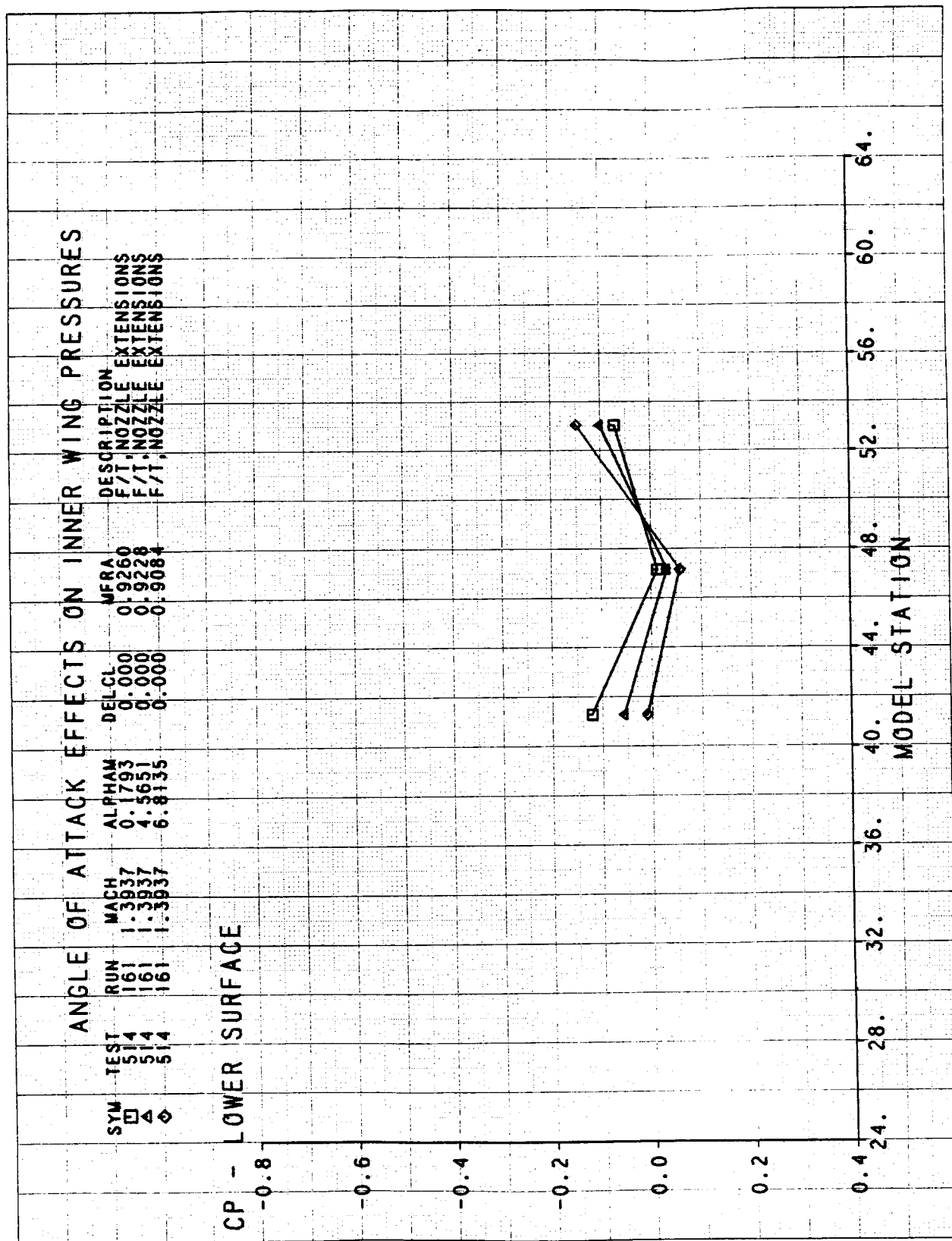


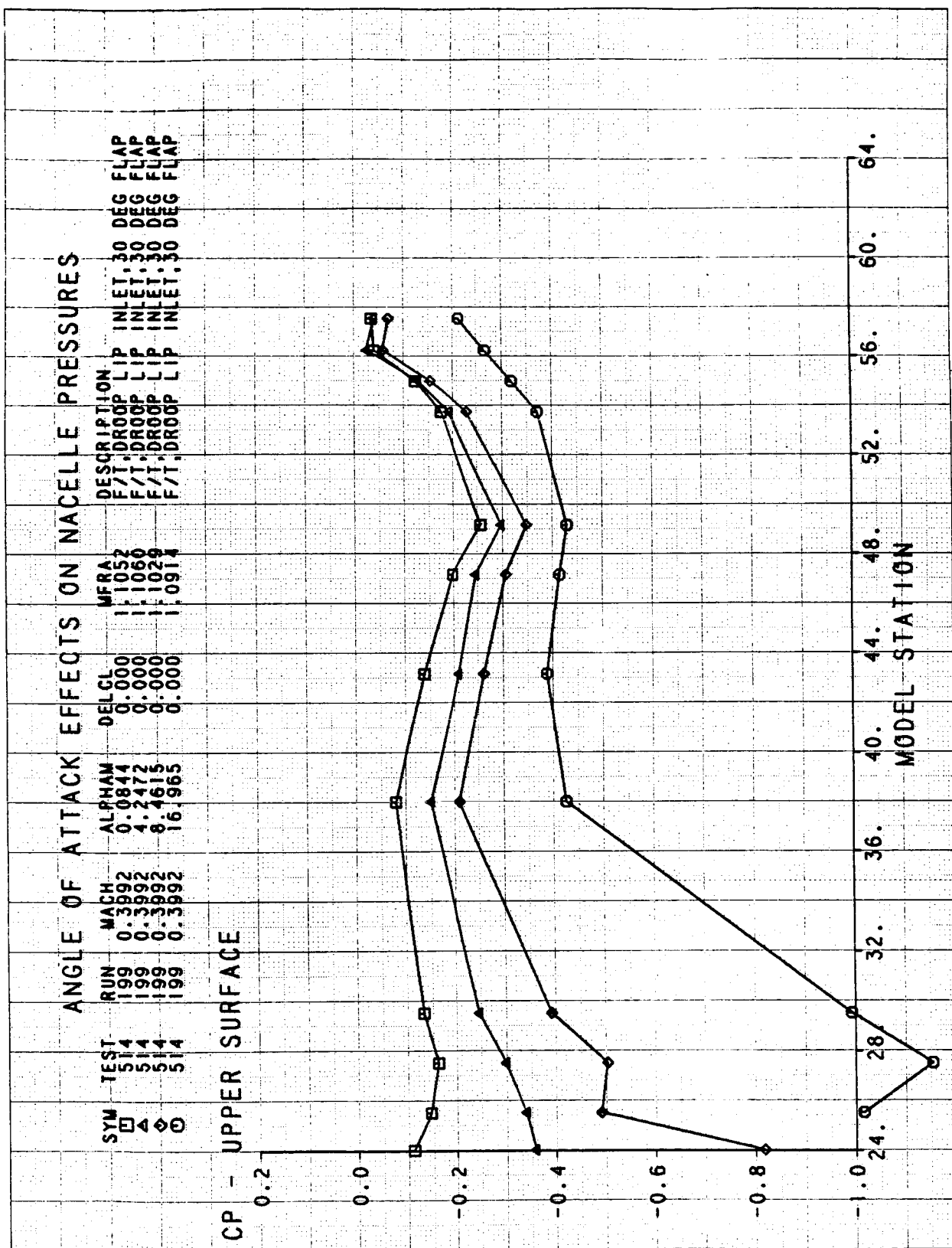




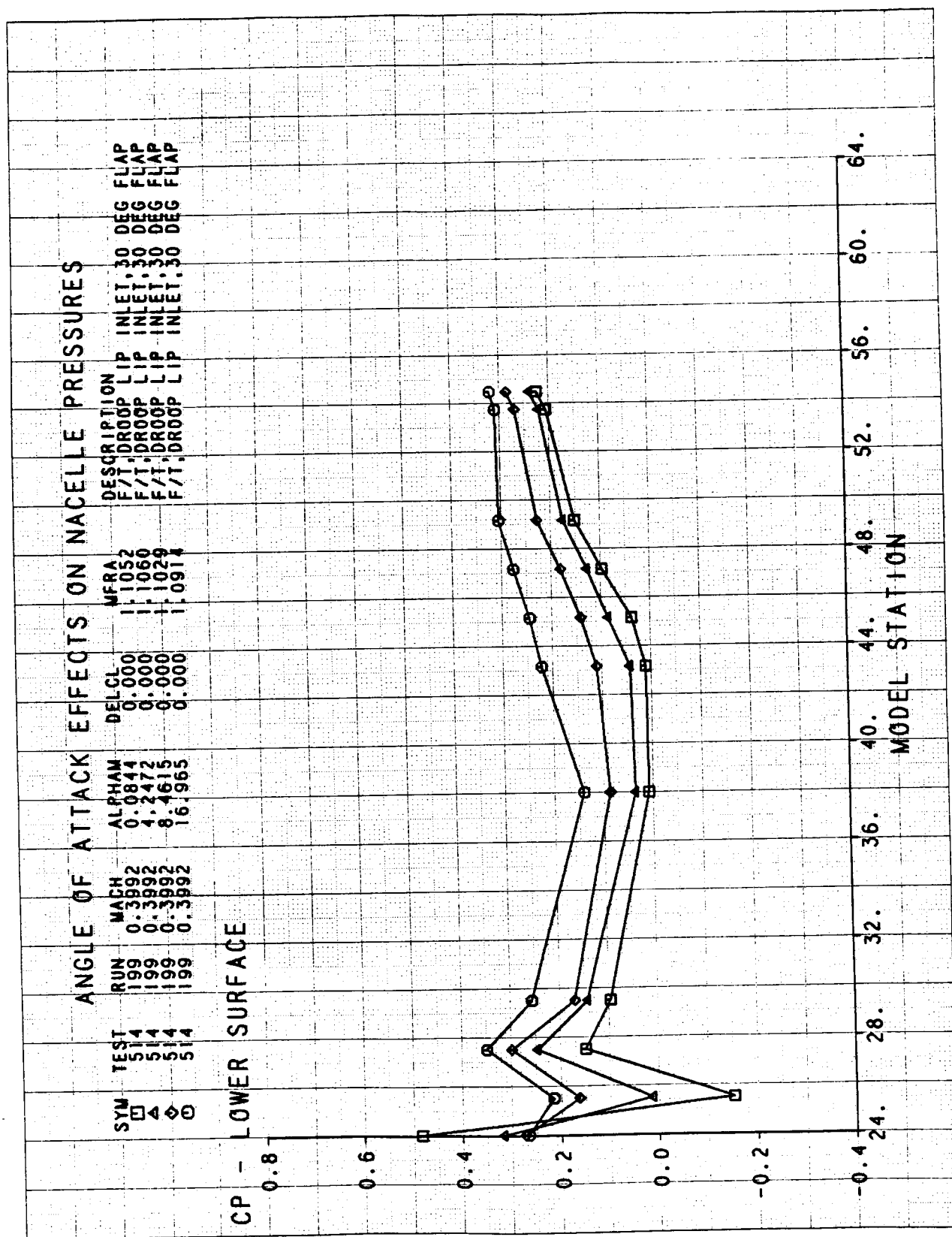


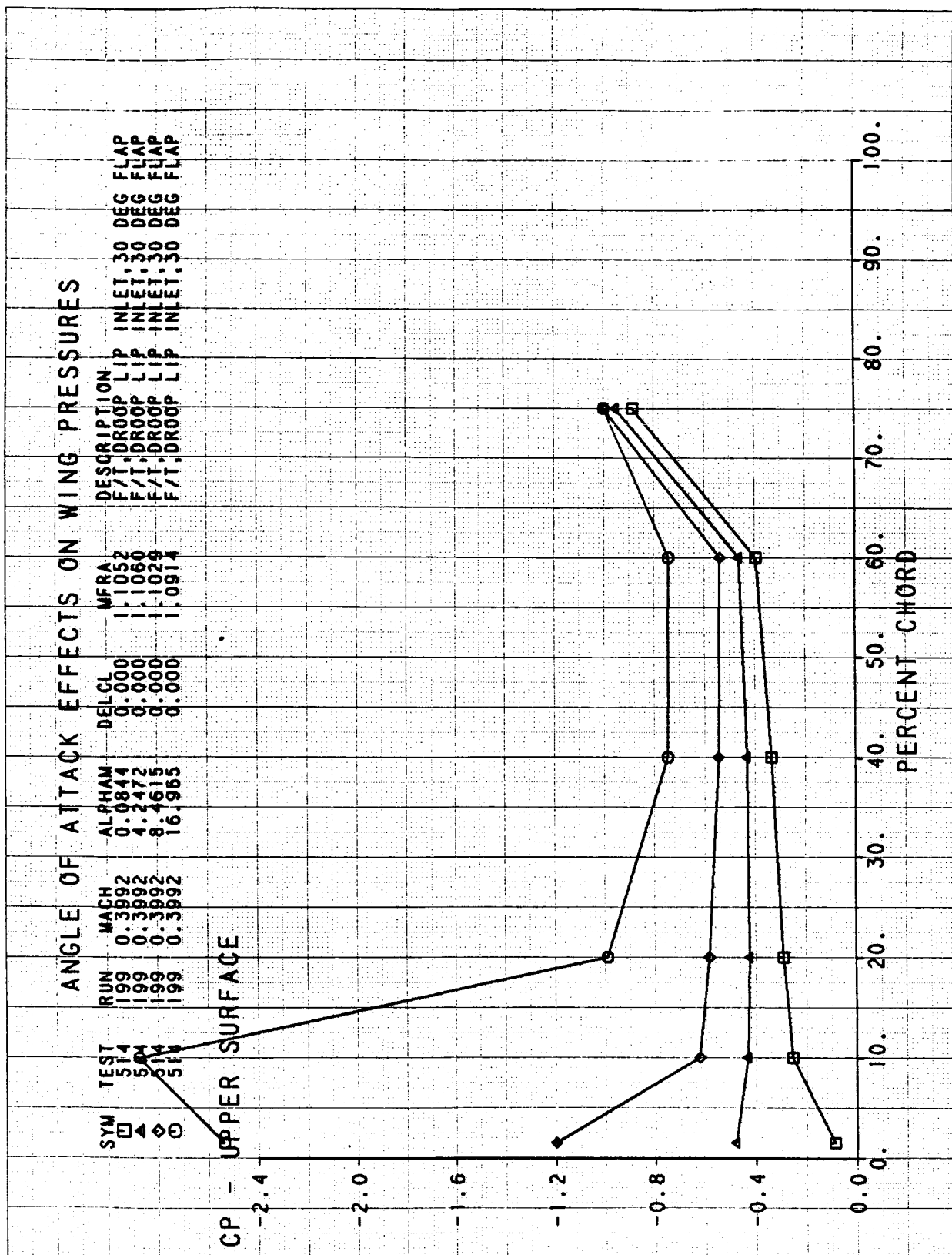


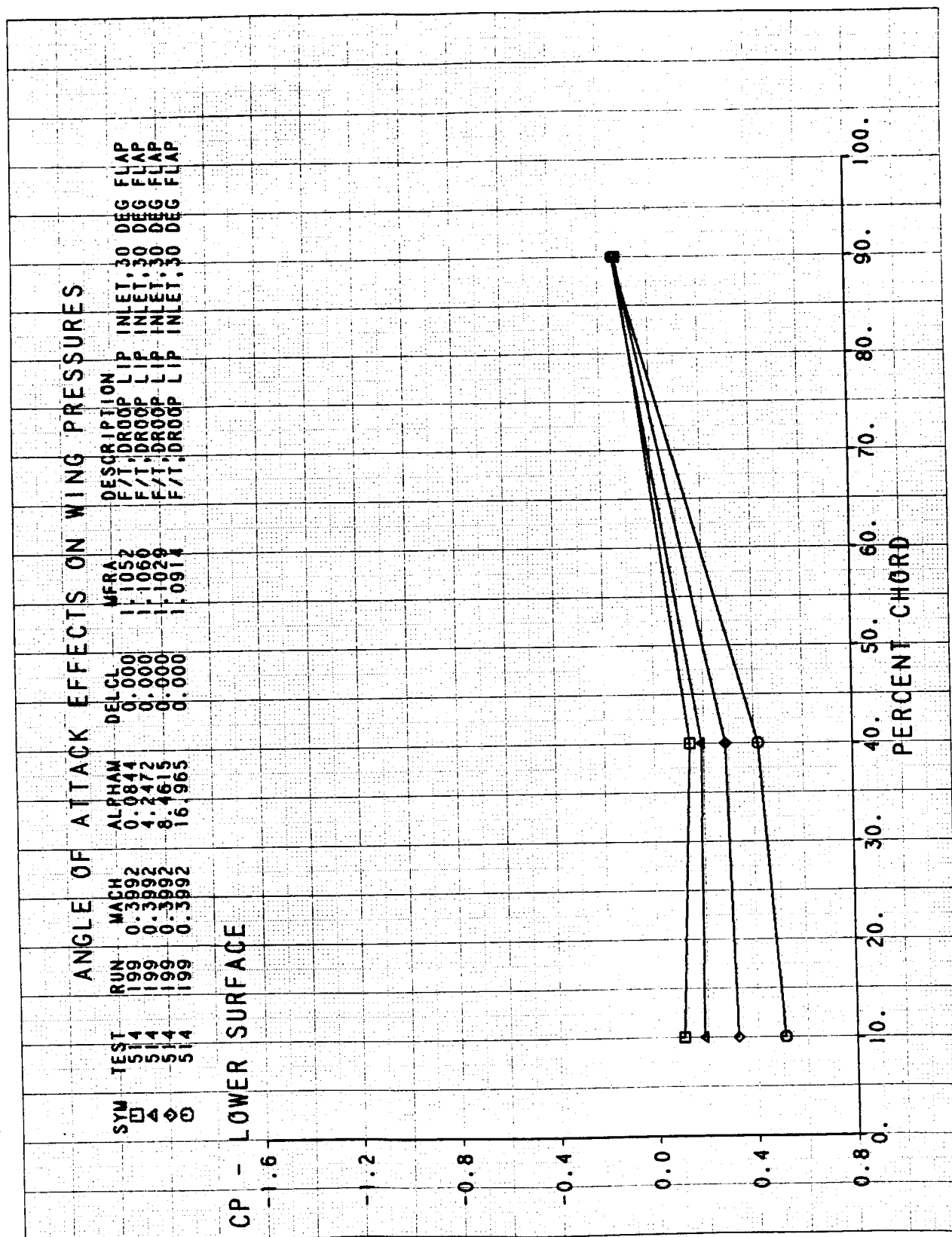


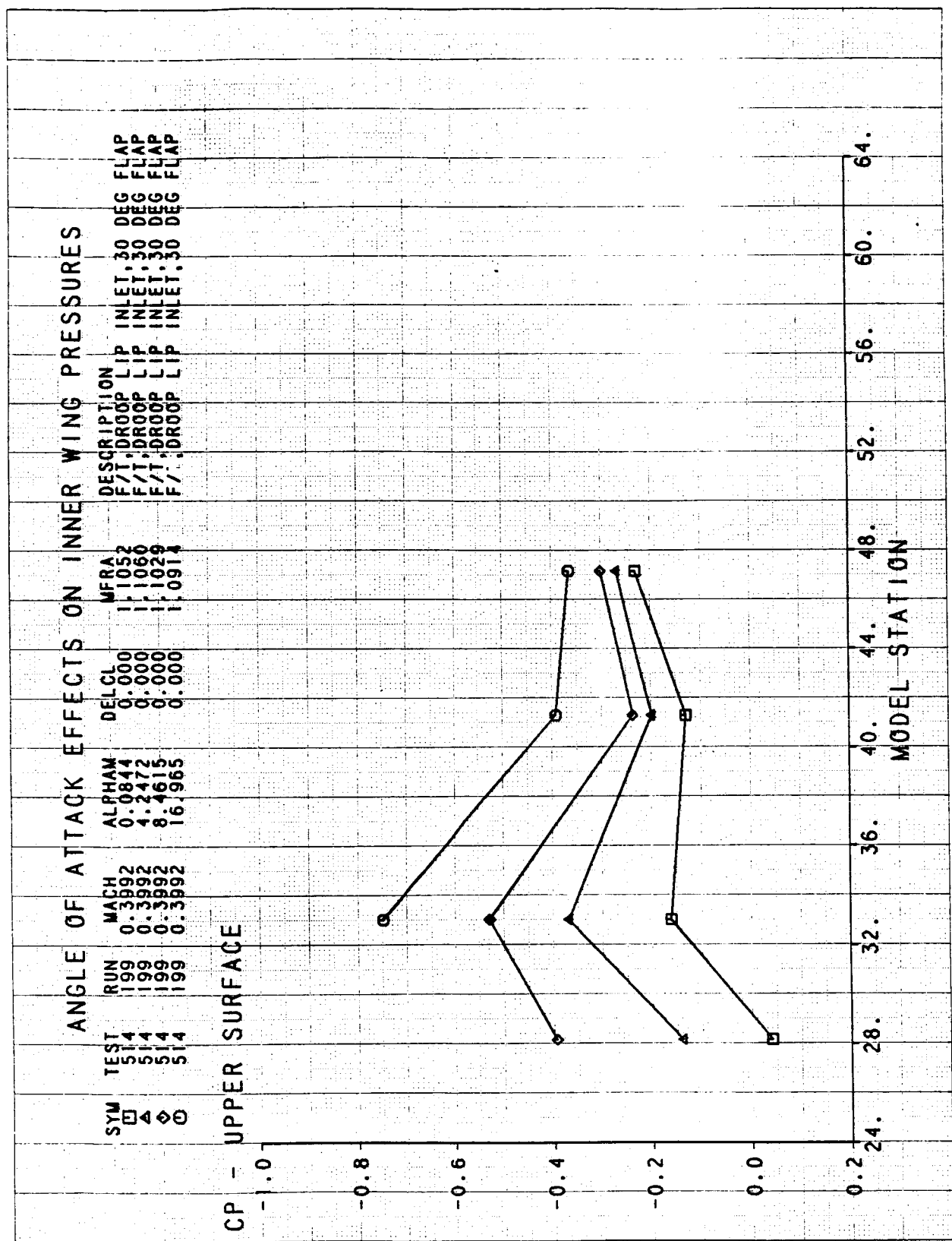


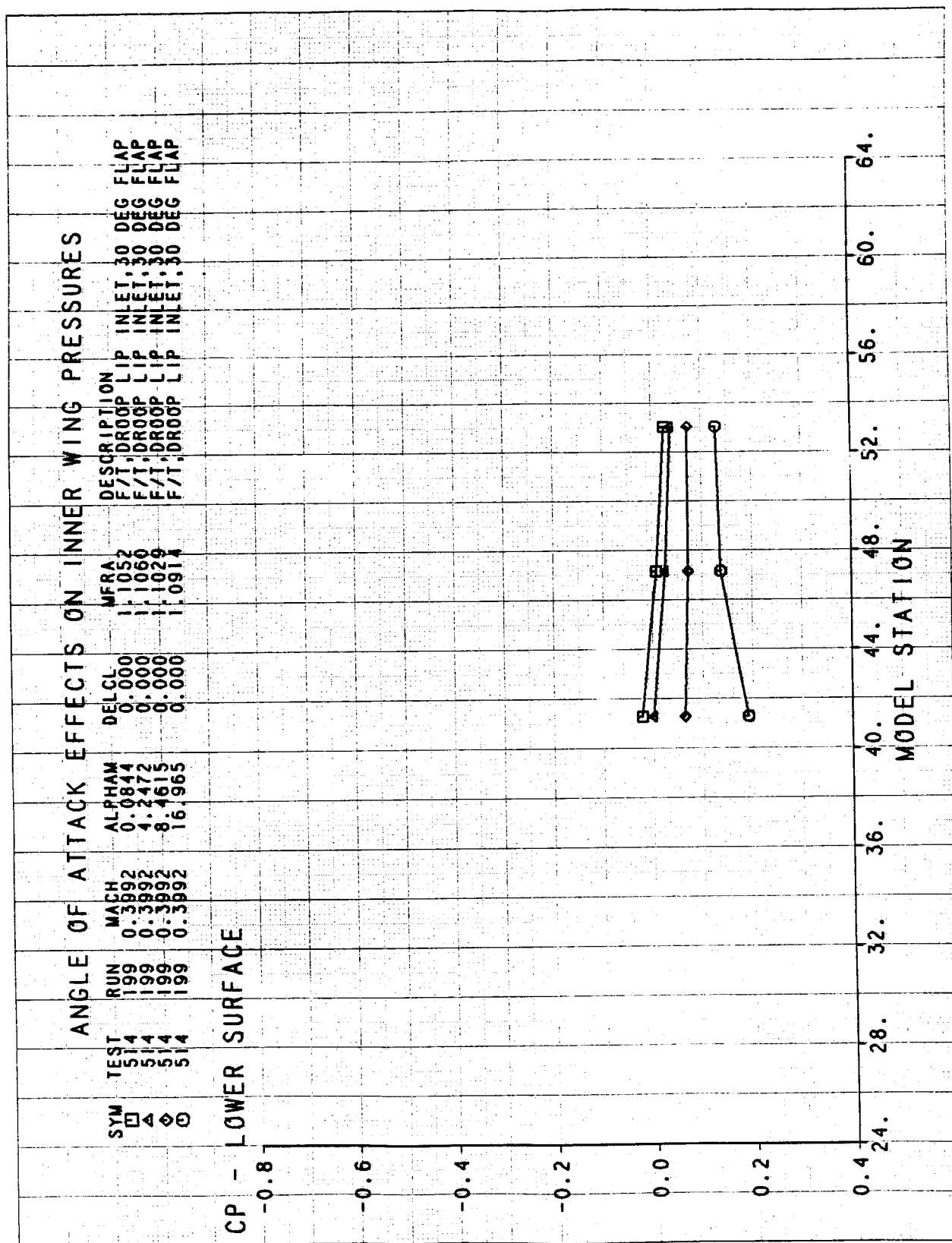


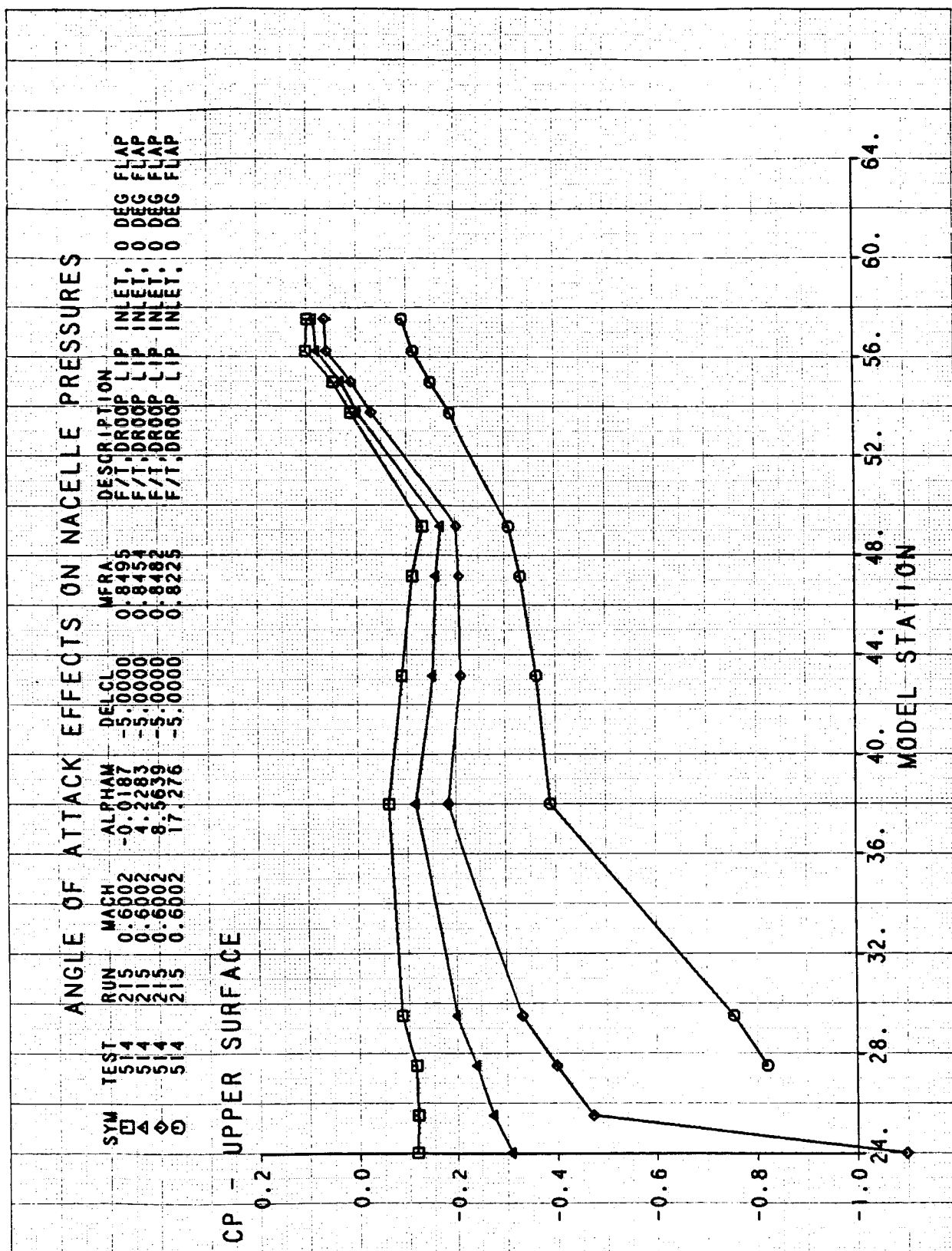


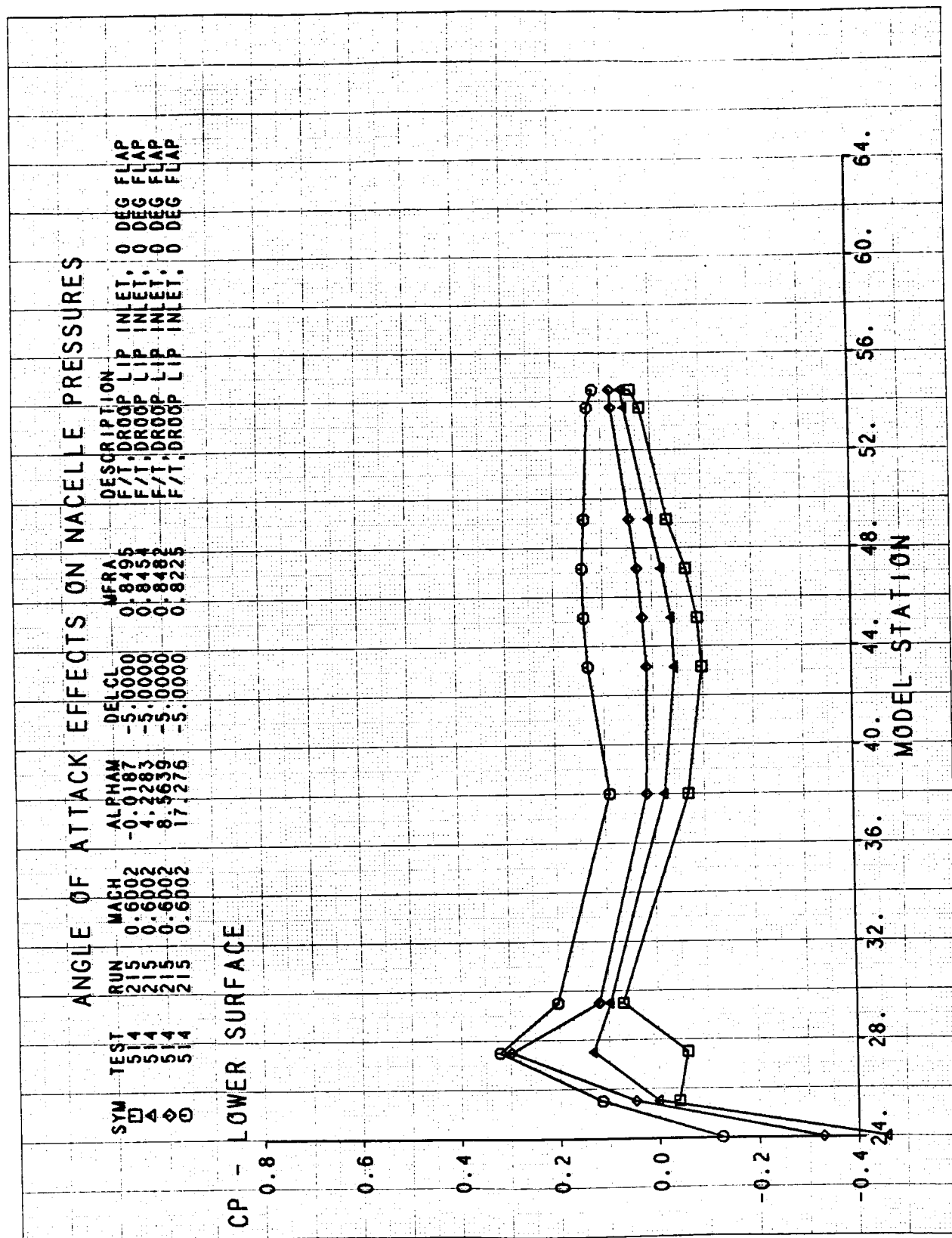


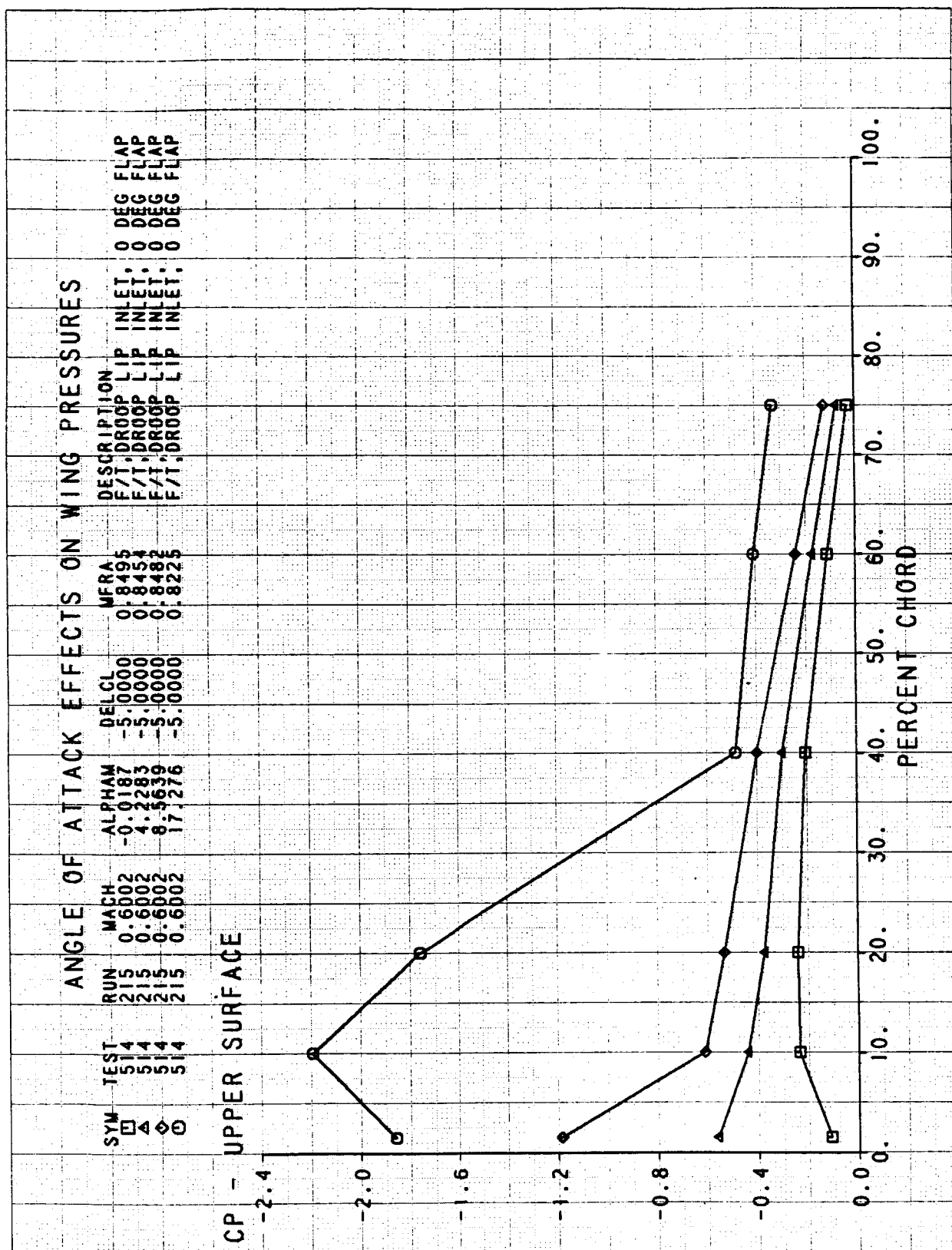




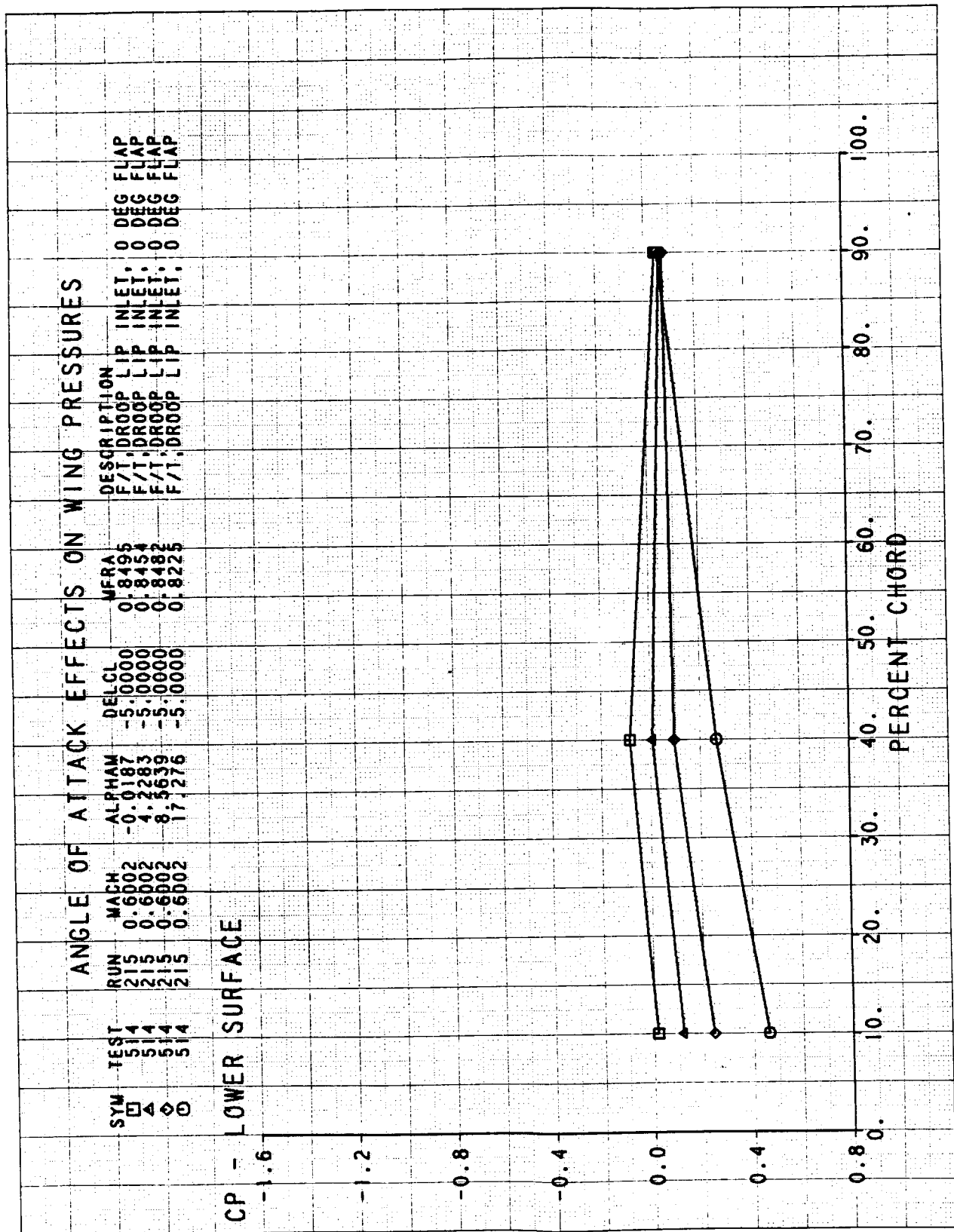








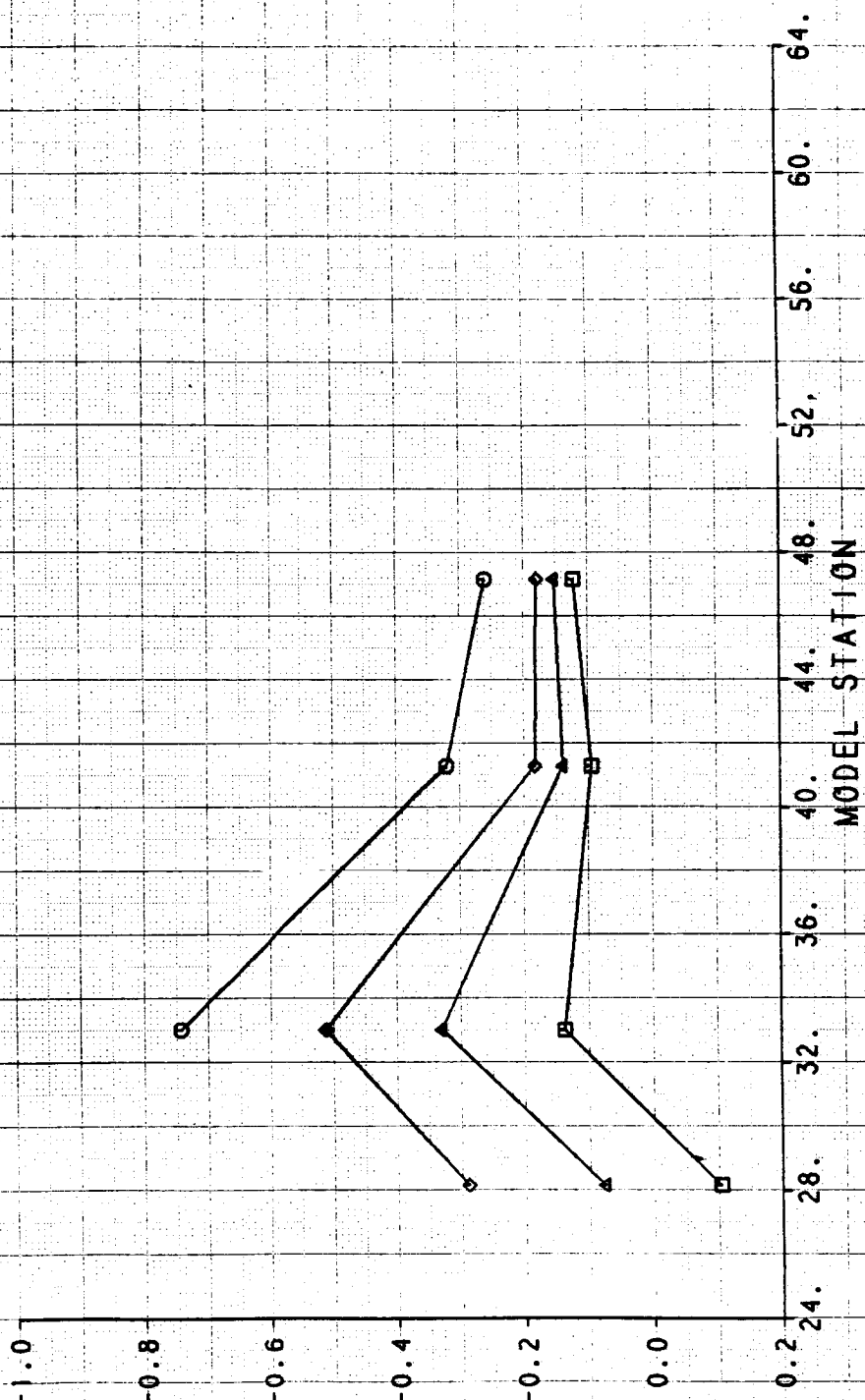


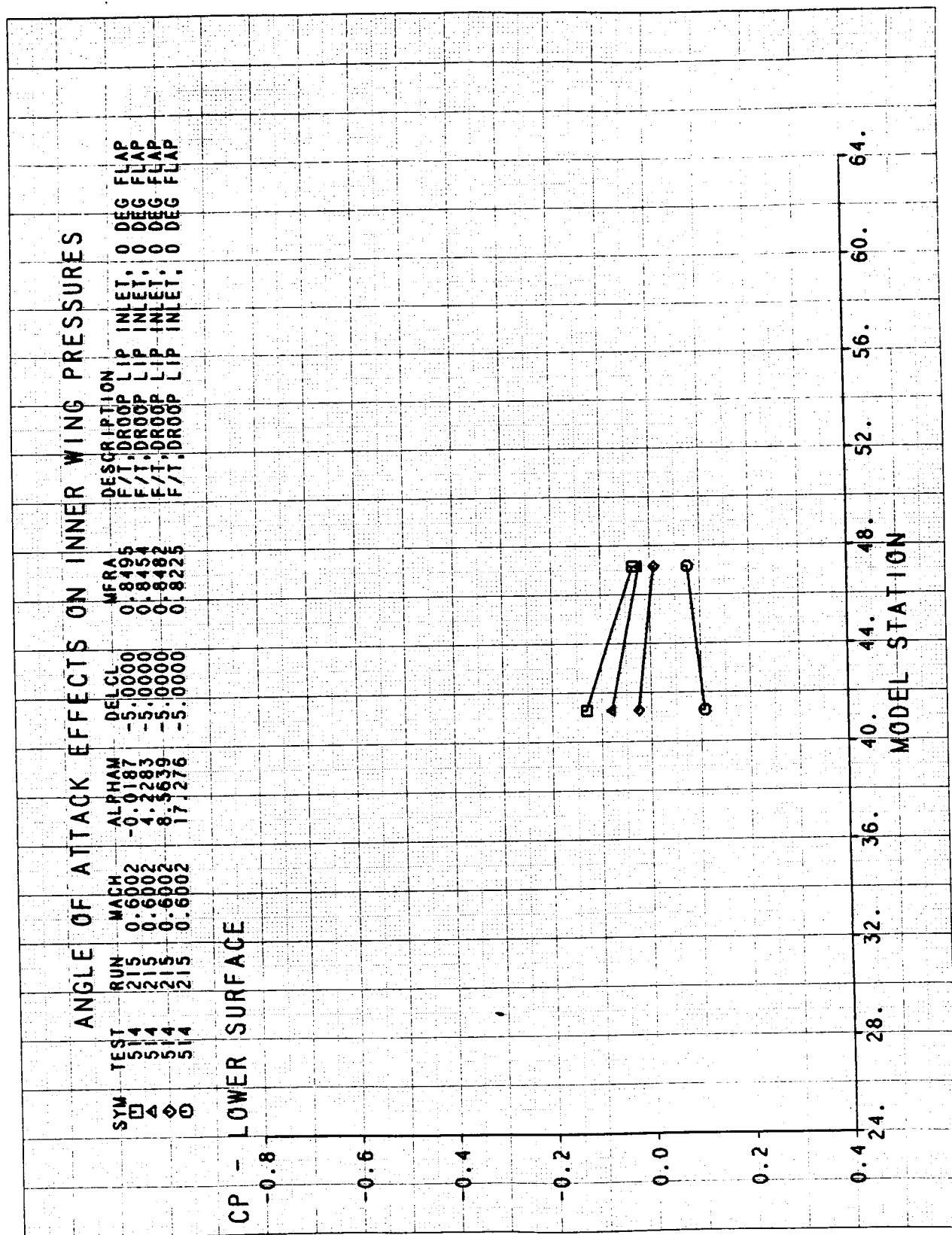


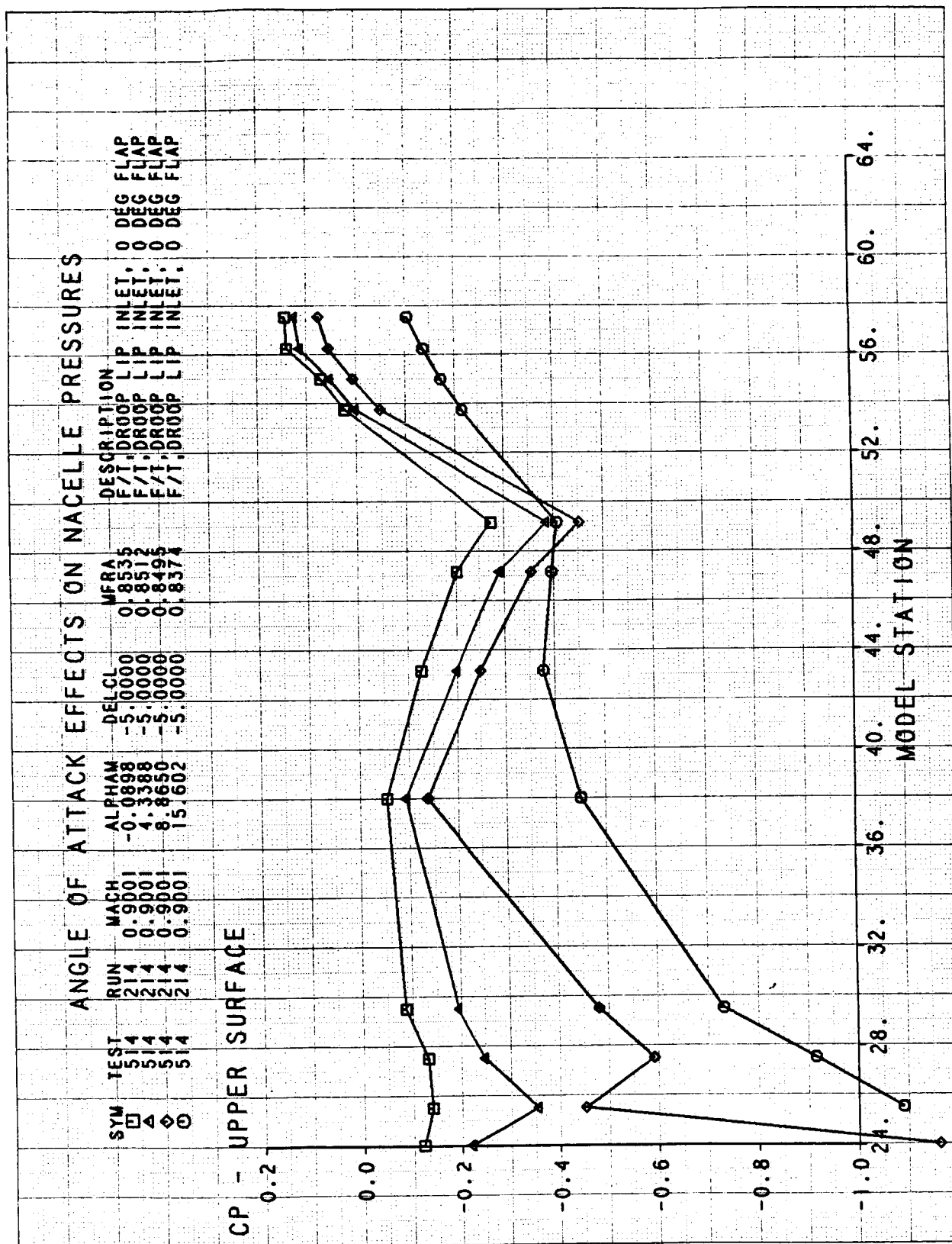
# ANGLE OF ATTACK EFFECTS ON INNER WING PRESSURES

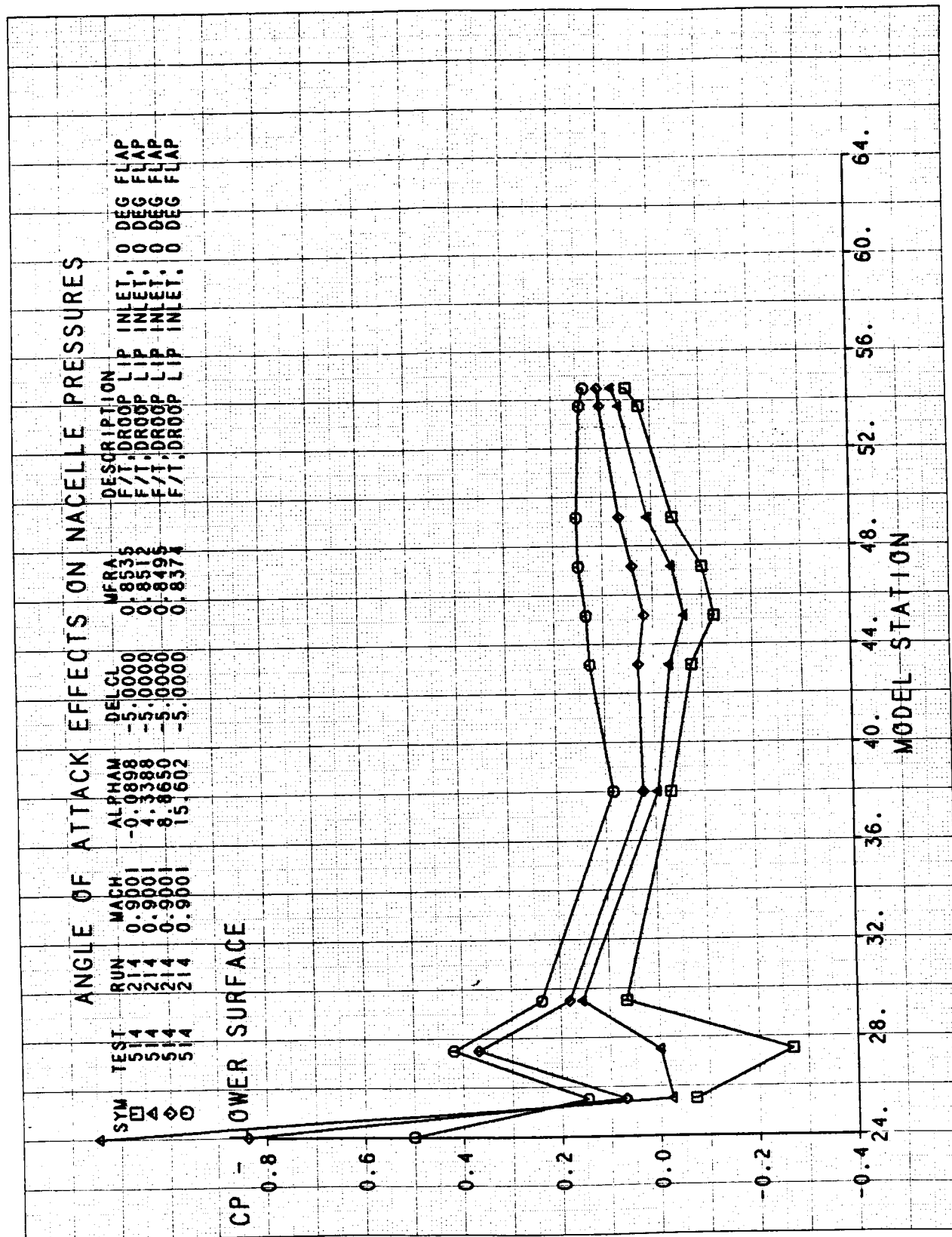
SYM	TEST	RUN	MACH	ALPHAM	DELCL	MFRA	DESCRIPTION	INLET	FLAP
□	514	215	0.6002	-0.0187	-5.0000	0.8495	F/T, DROOP LIP	0 DEG	FLAP
△	514	215	0.6002	4.2283	-5.0000	0.8454	F/T, DROOP LIP	0 DEG	FLAP
◇	514	215	0.6002	8.5639	-5.0000	0.8482	F/T, DROOP LIP	0 DEG	FLAP
○	514	215	0.6002	17.276	-5.0000	0.8225	F/T, DROOP LIP	0 DEG	FLAP

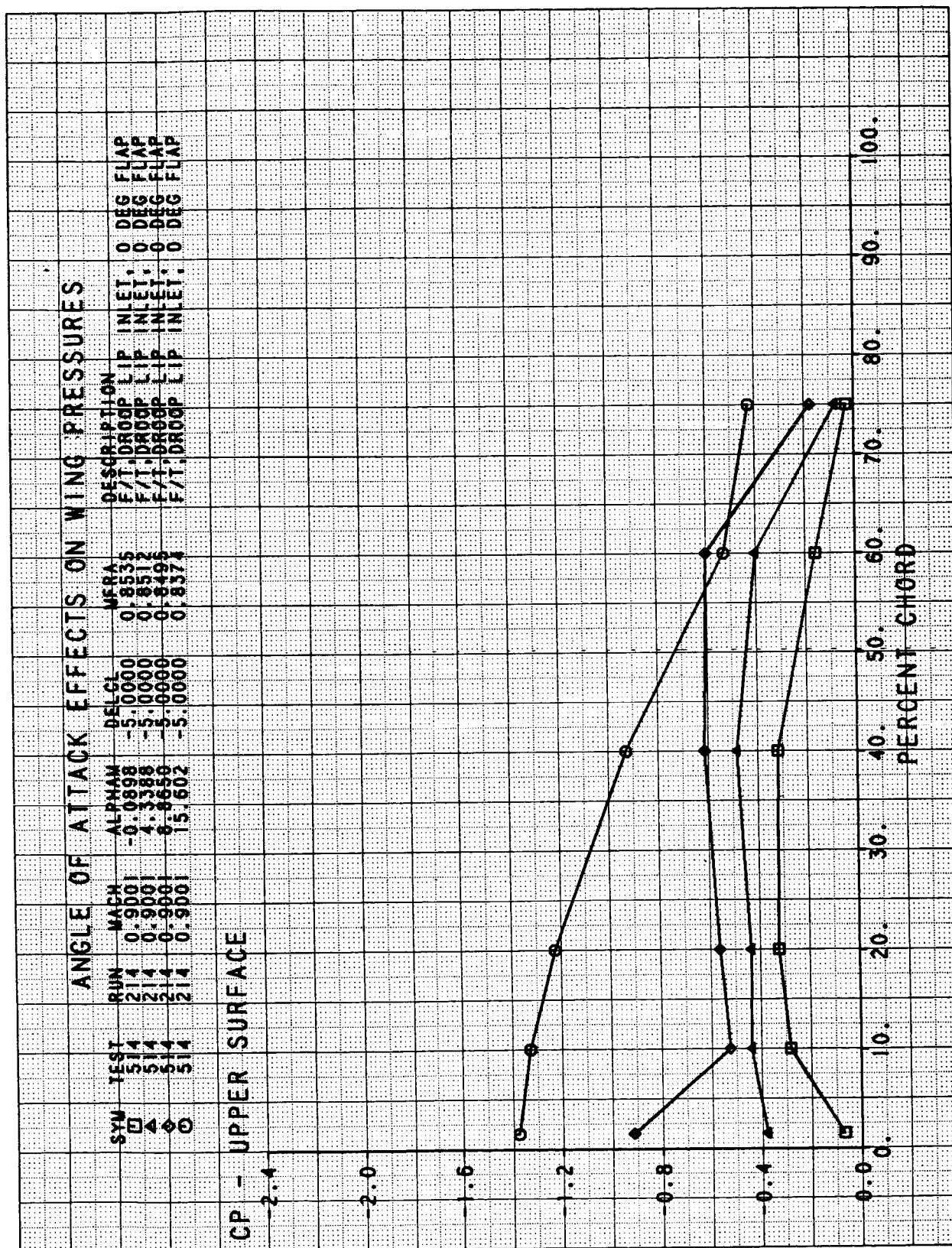
CP - UPPER SURFACE

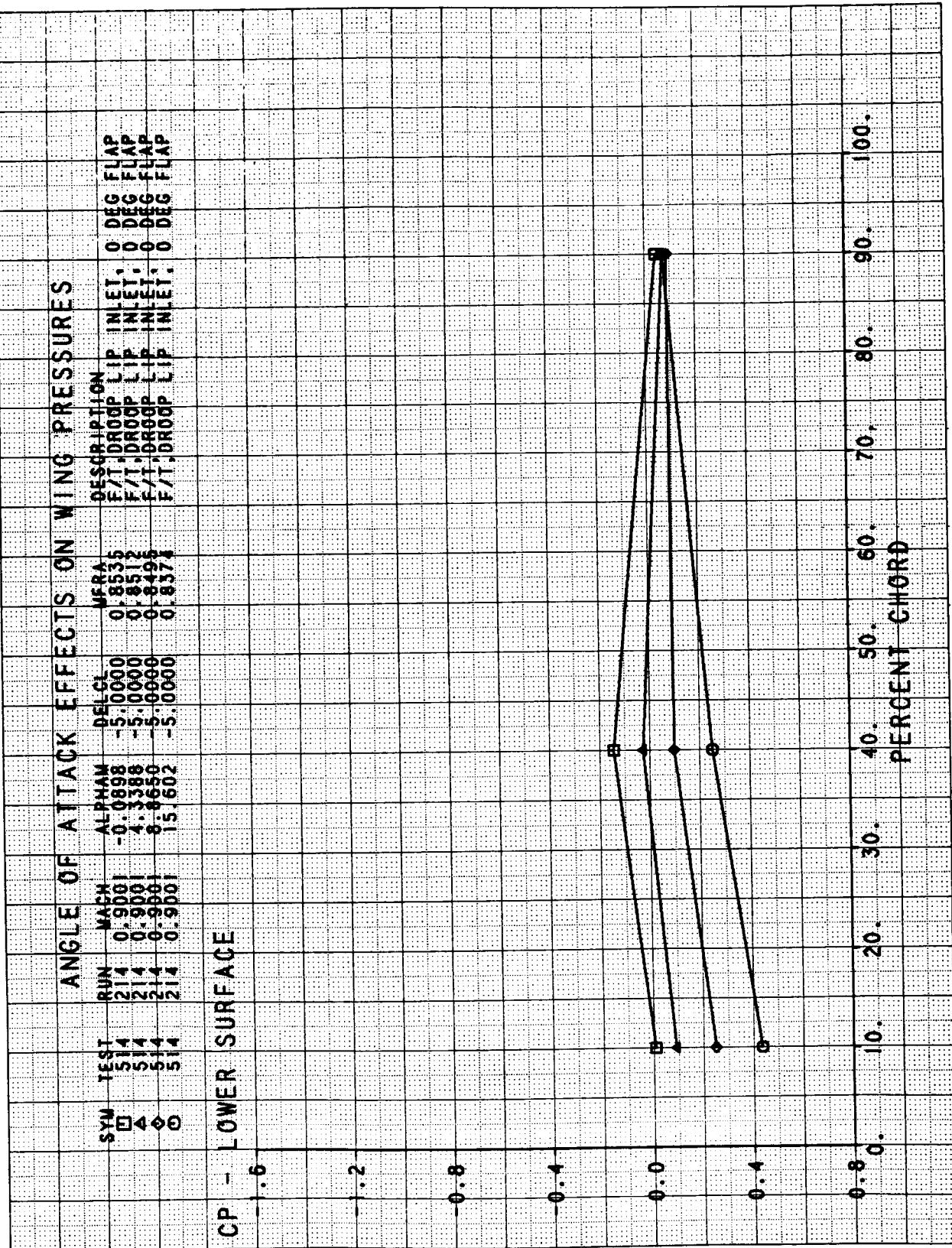


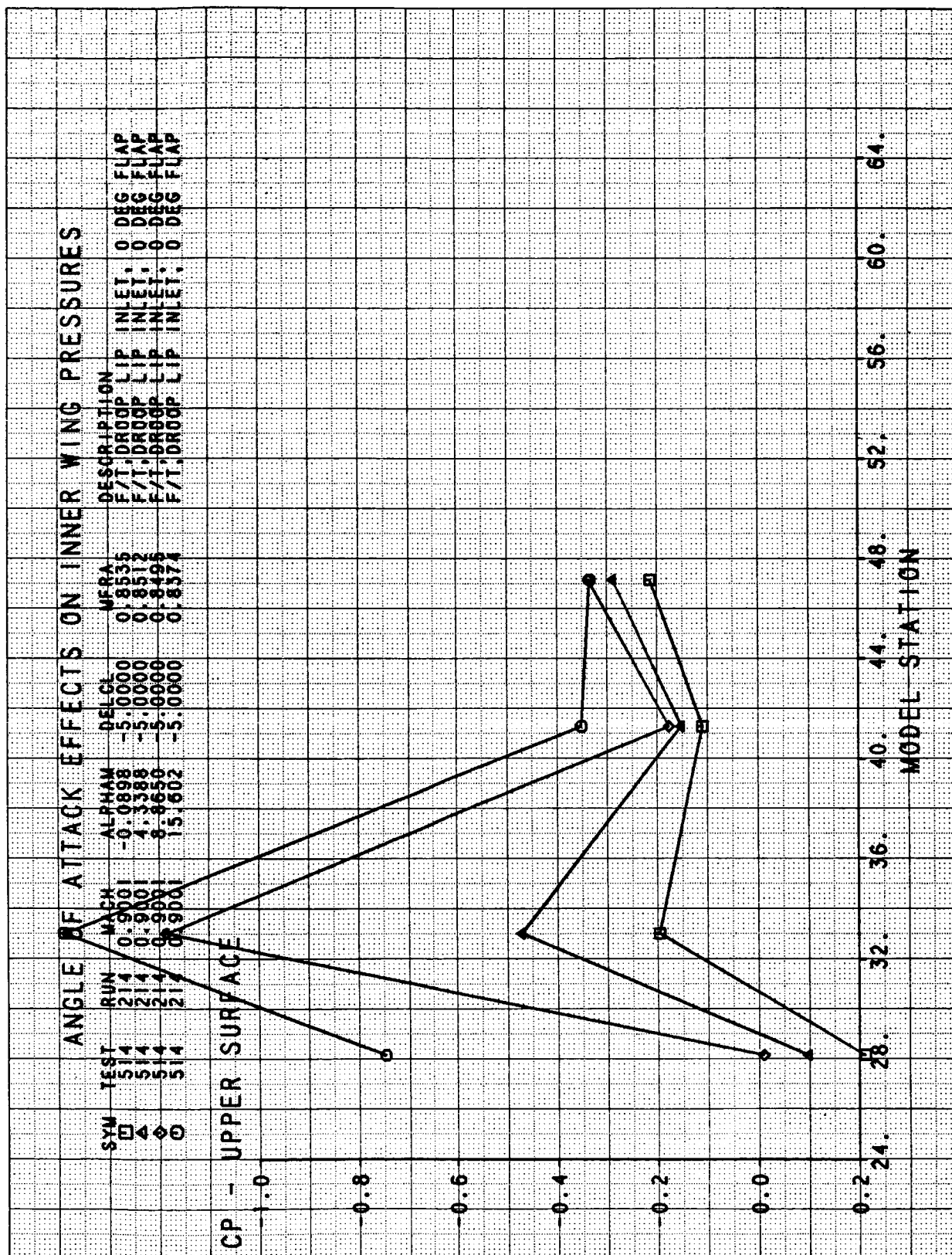




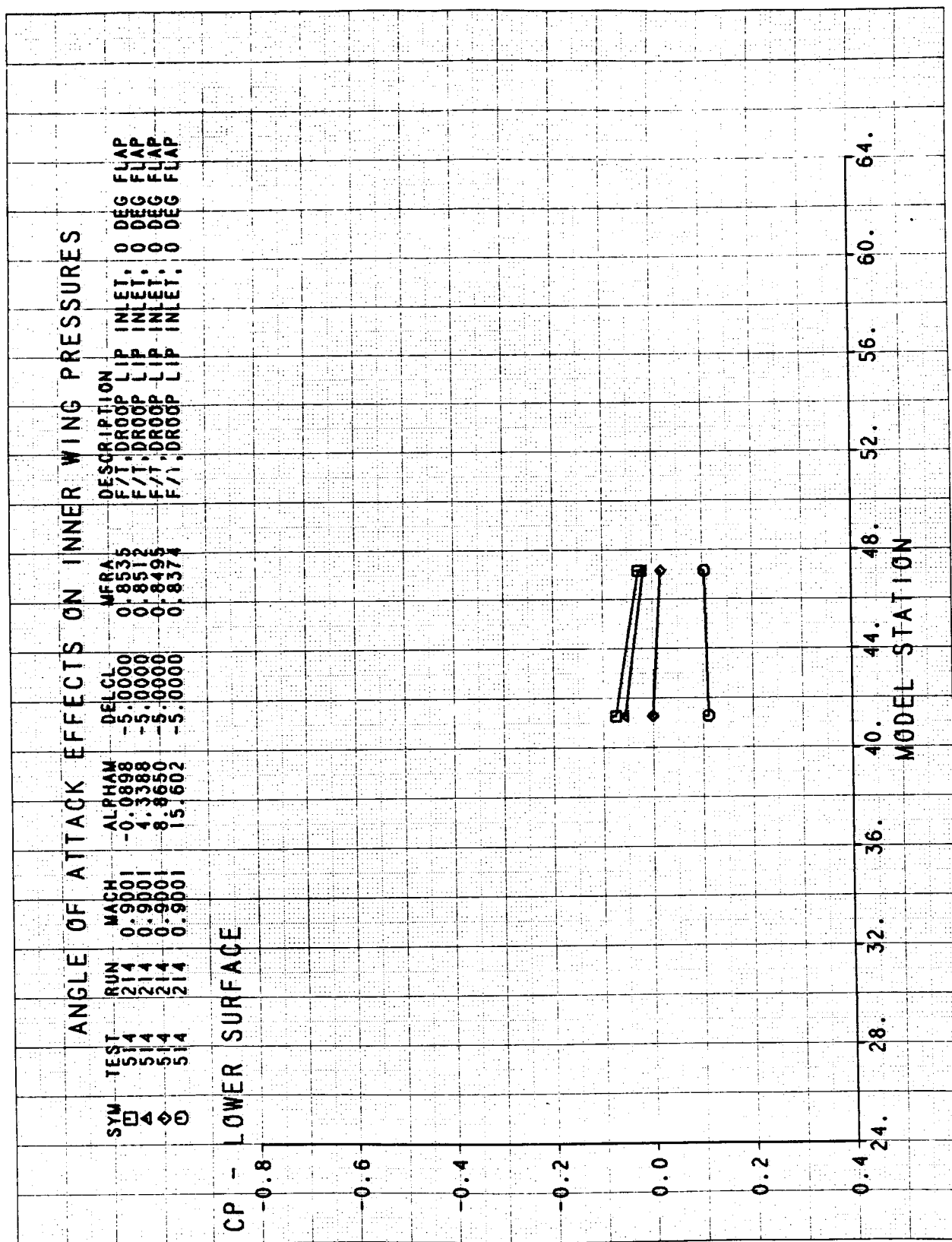


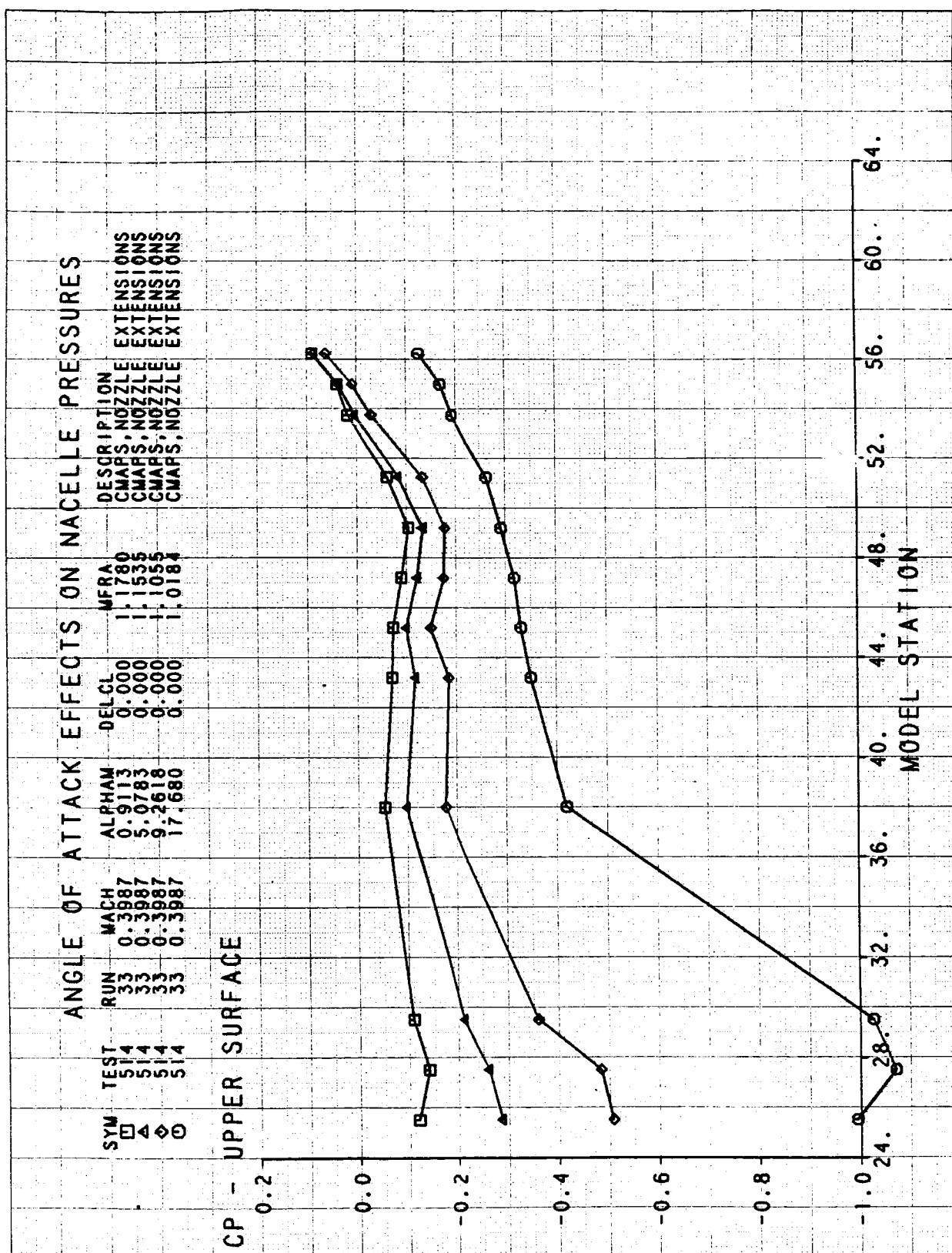


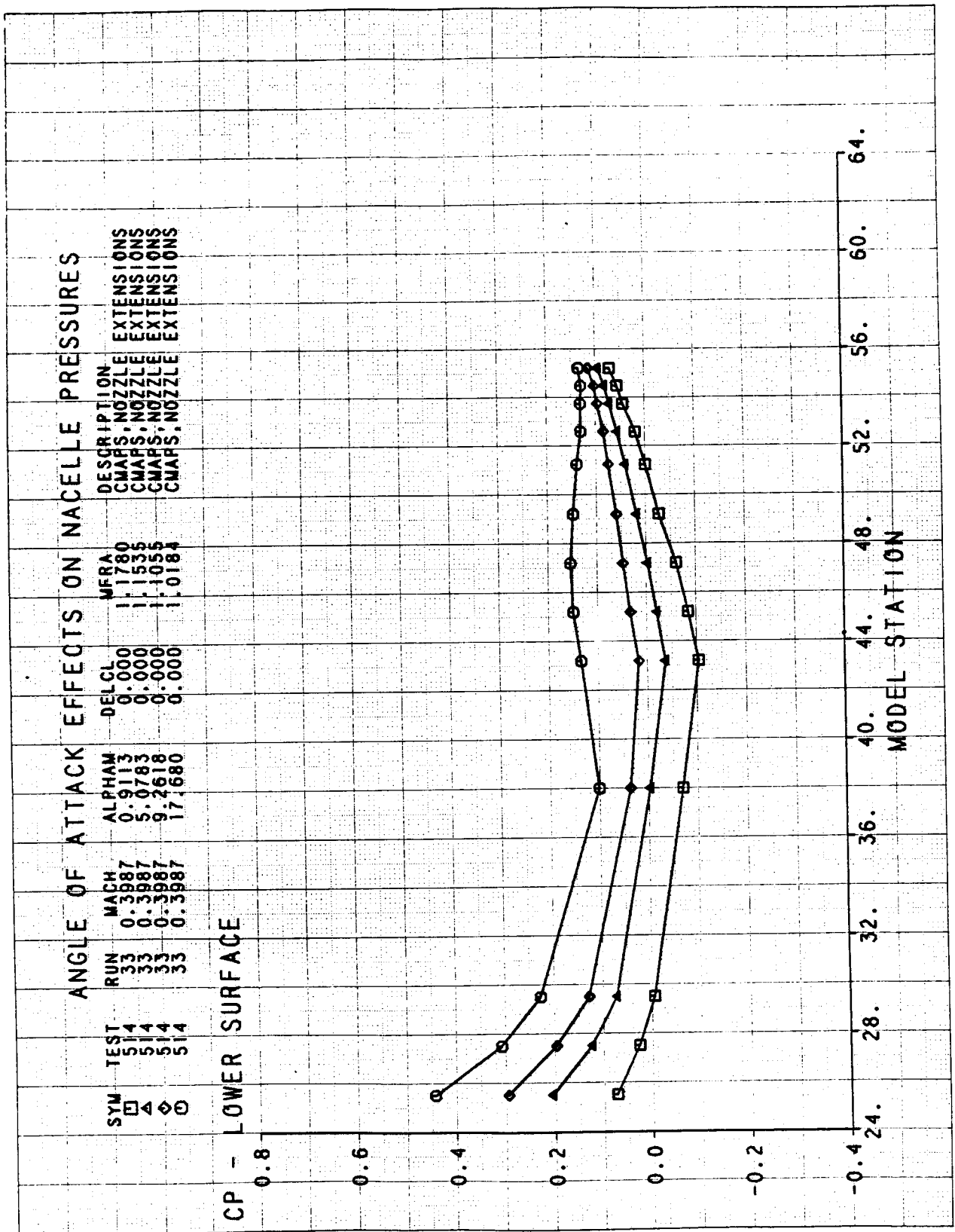


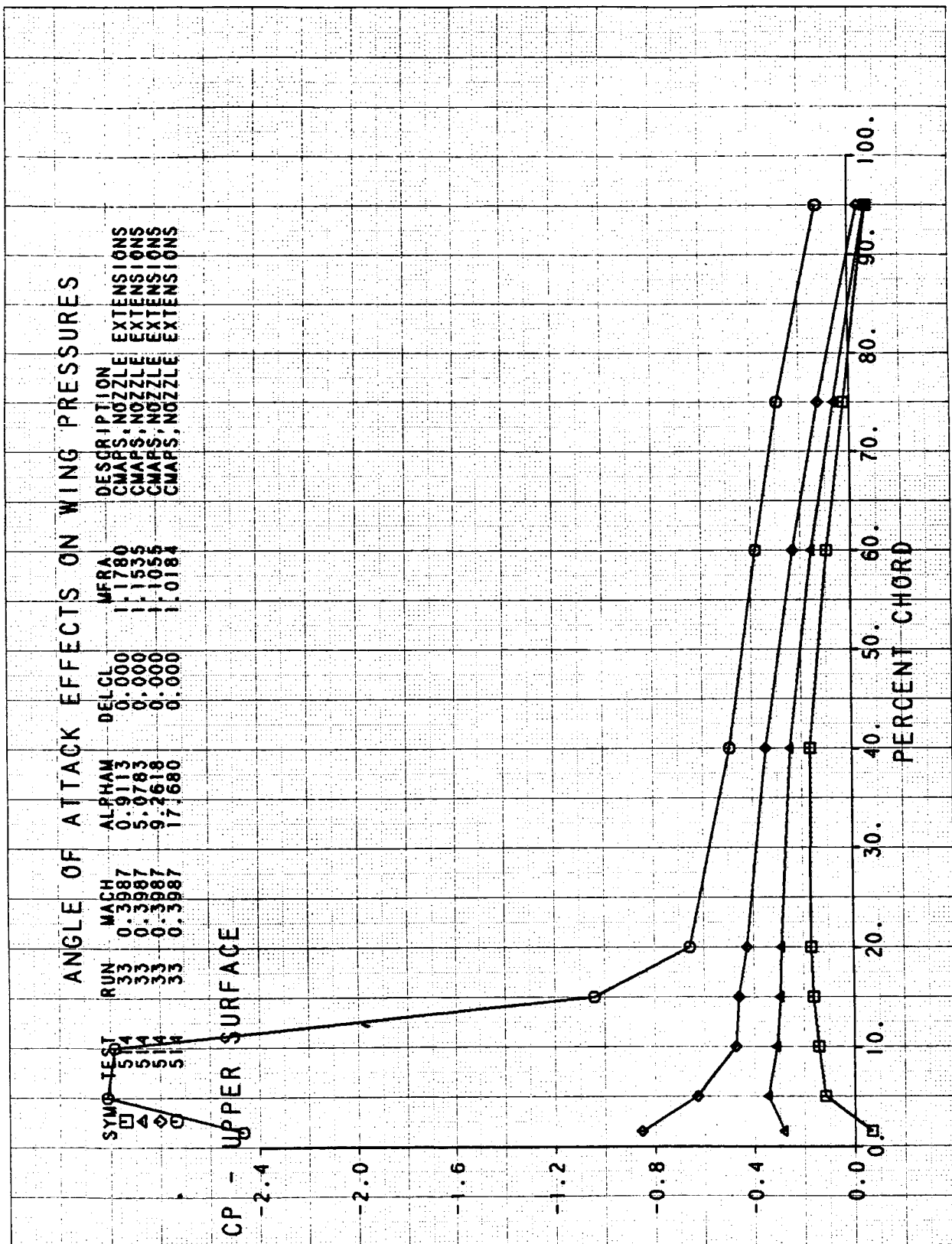


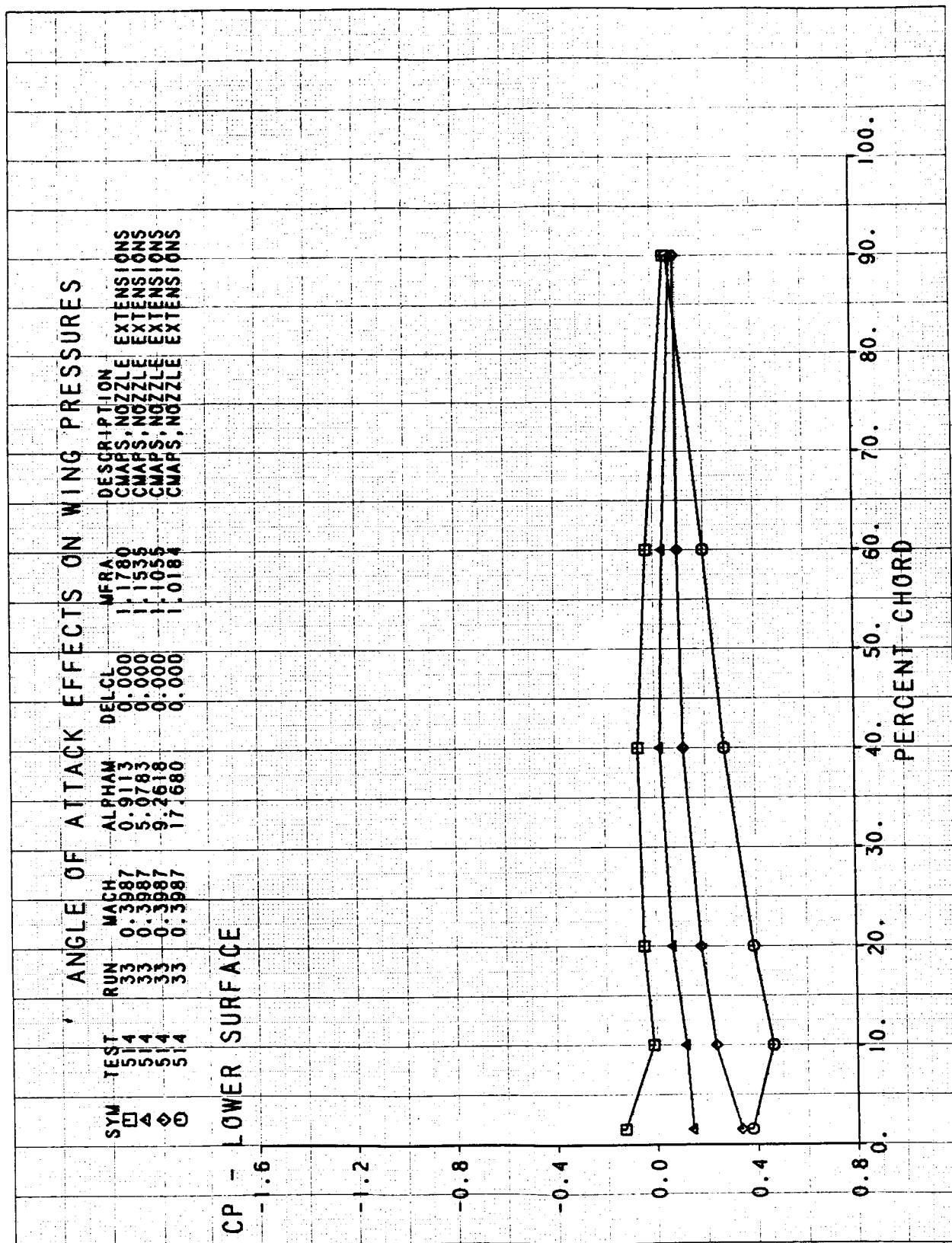


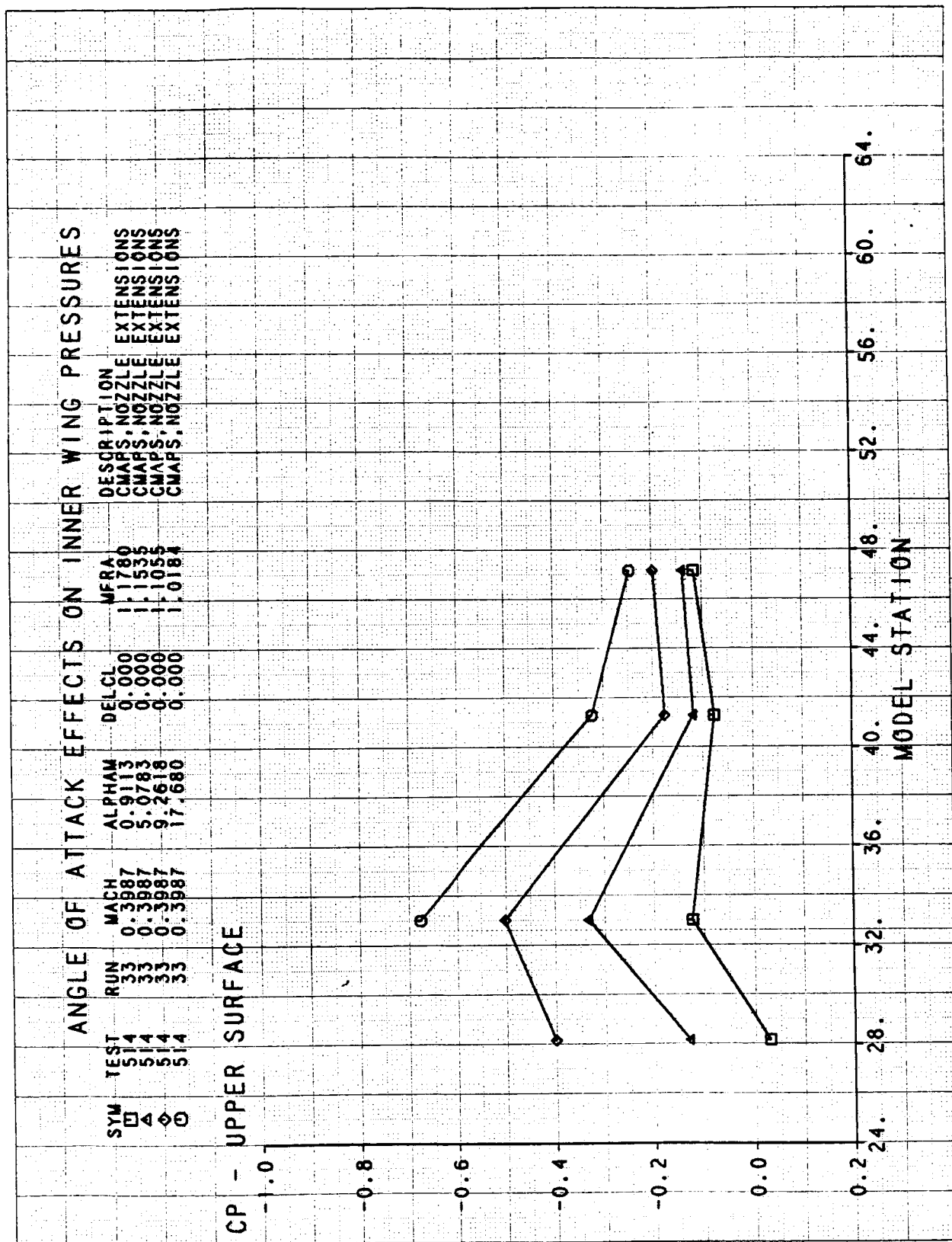


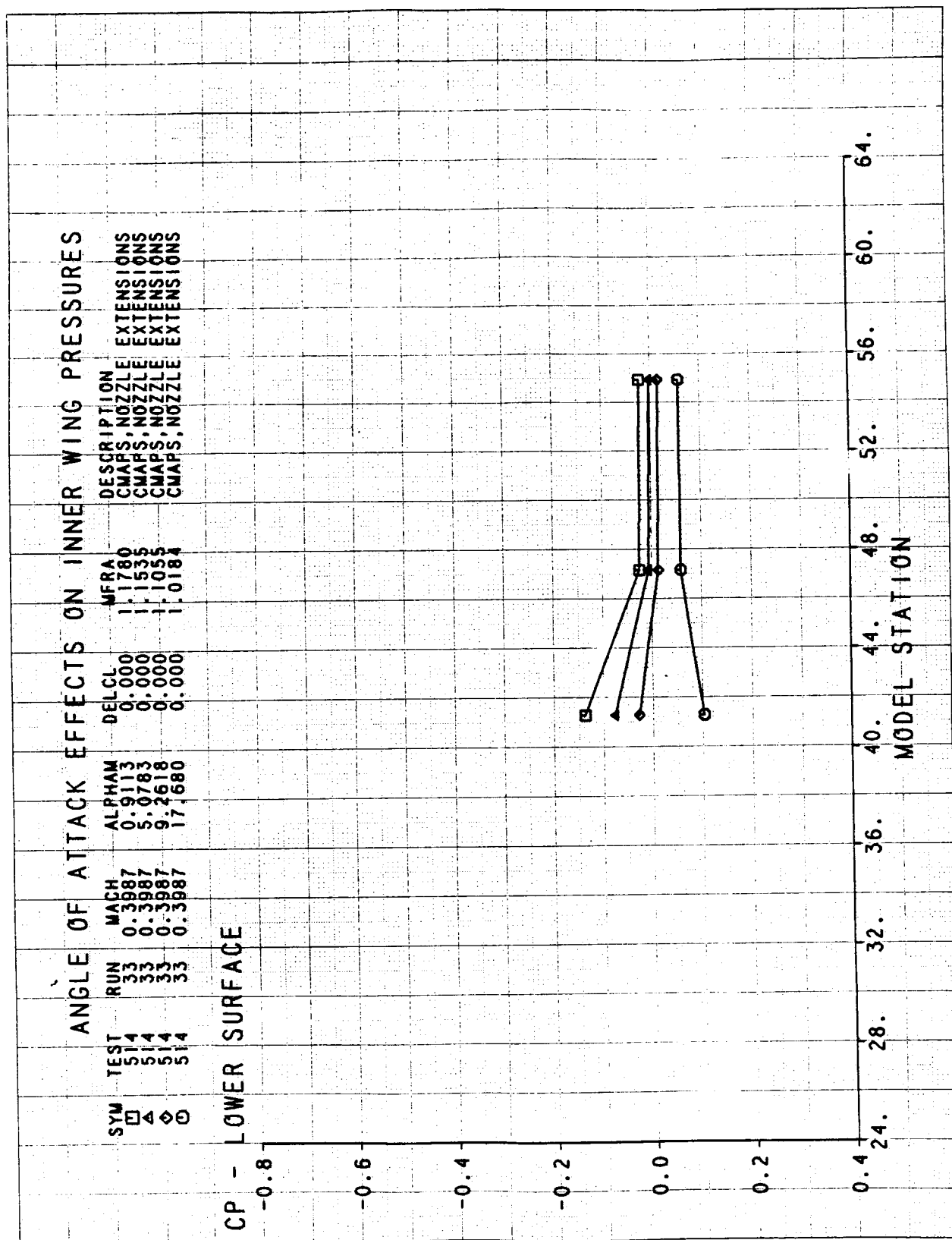


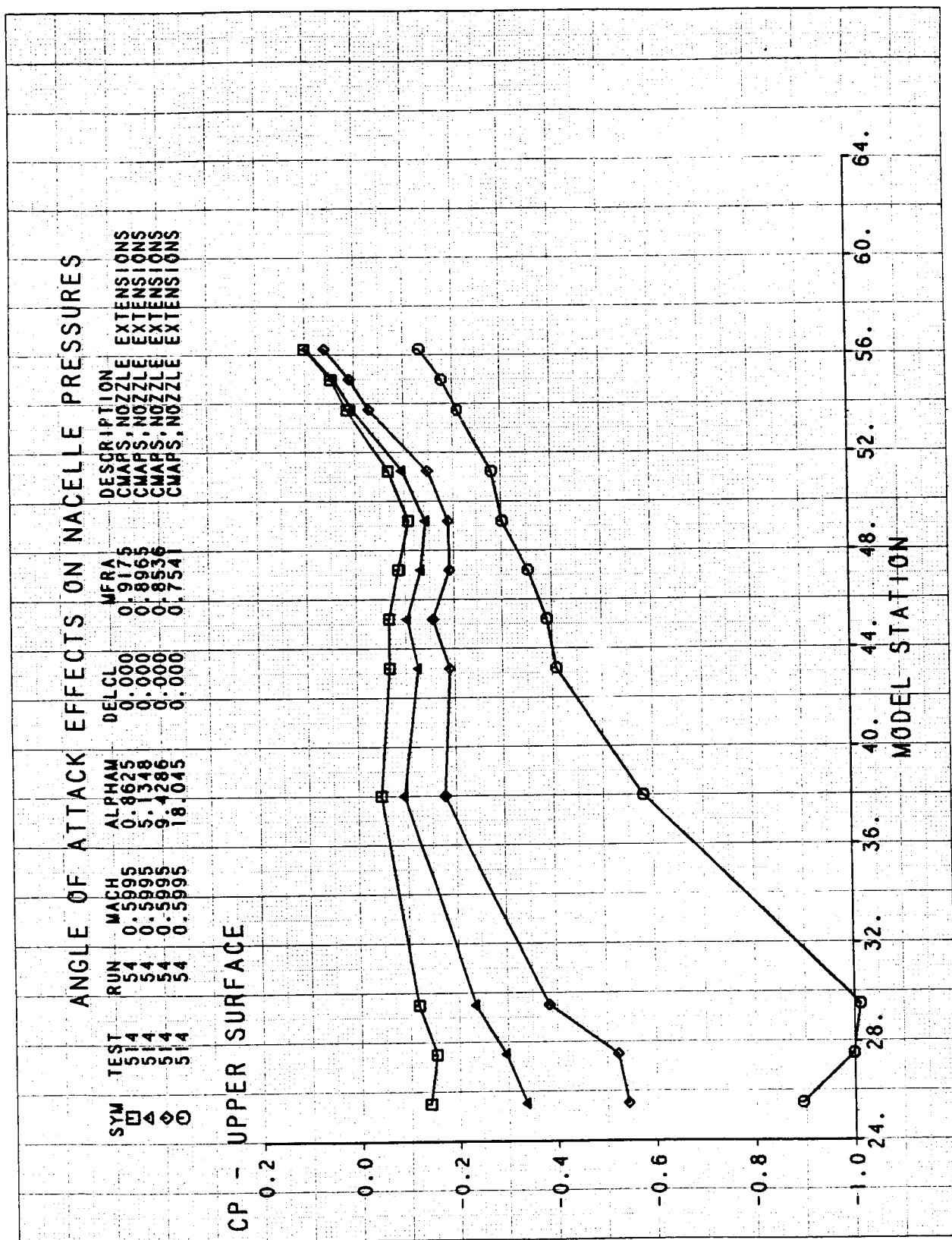




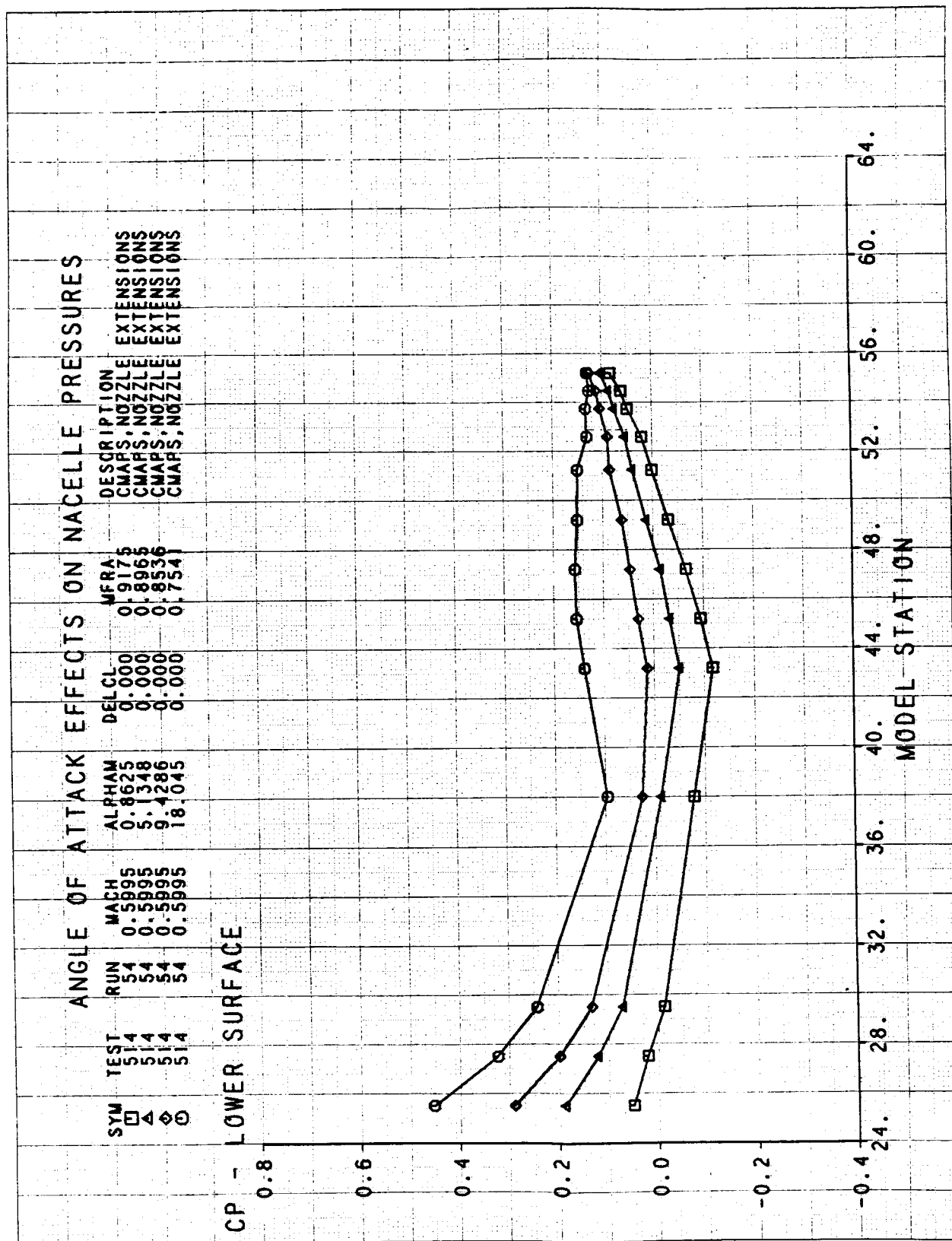


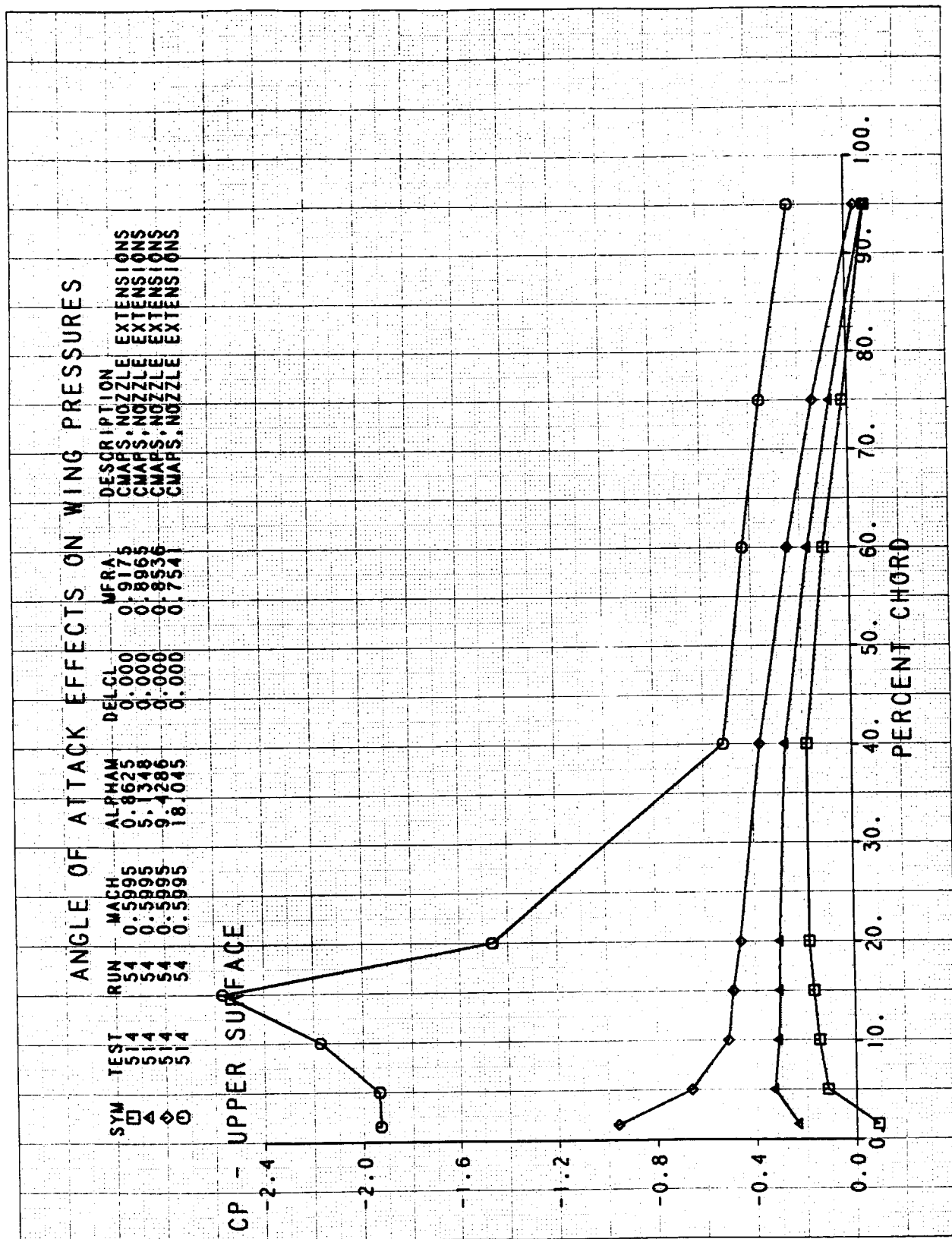


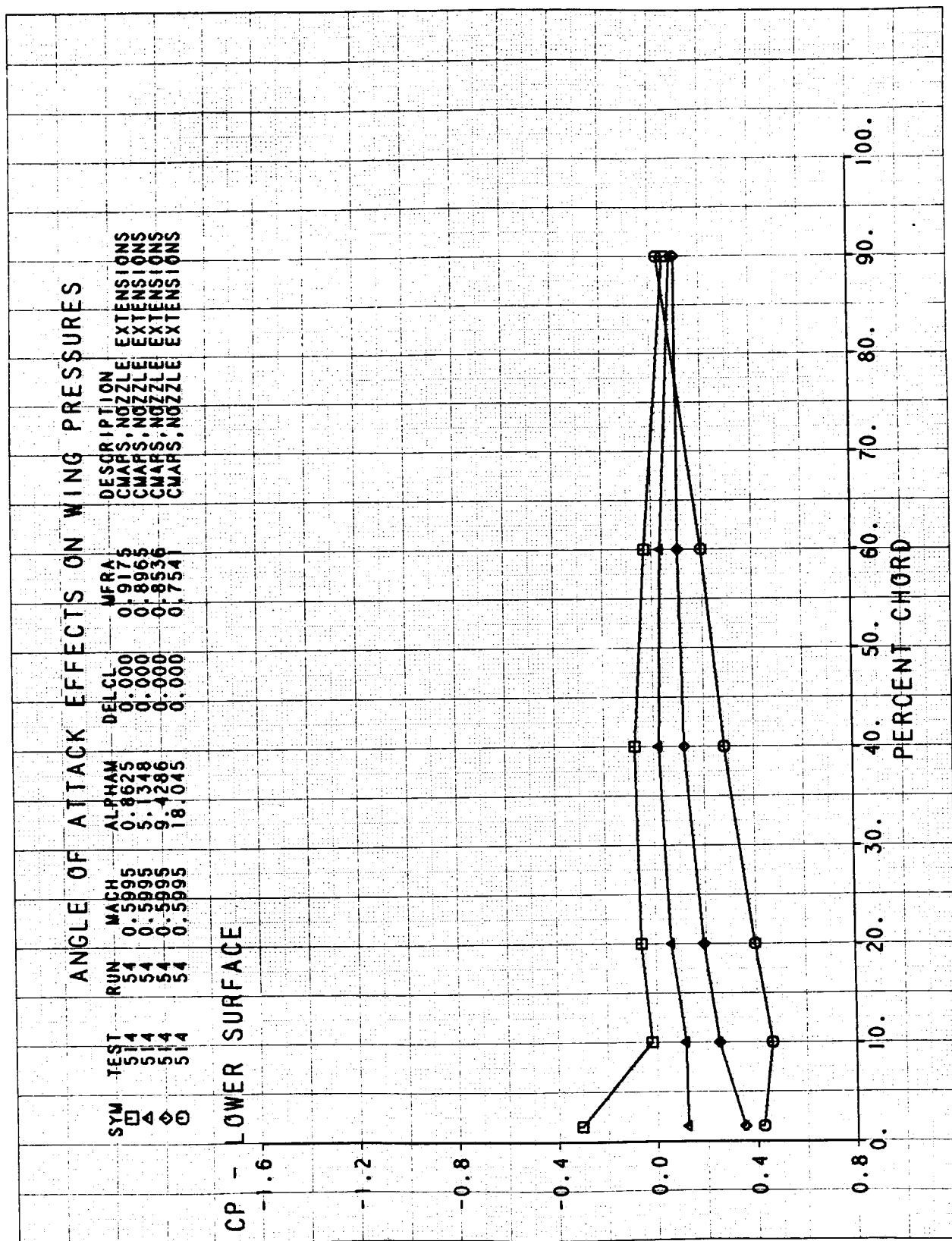


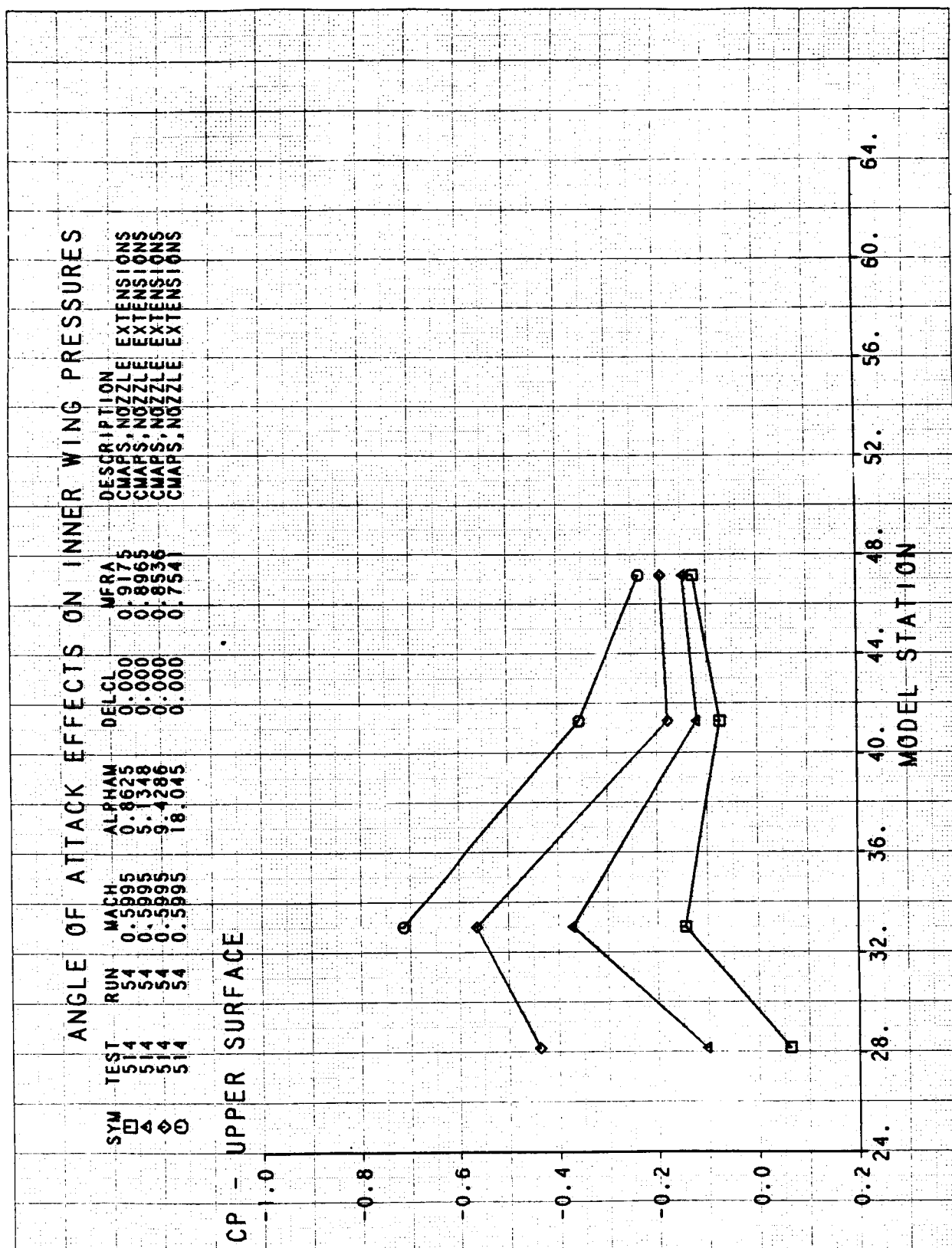


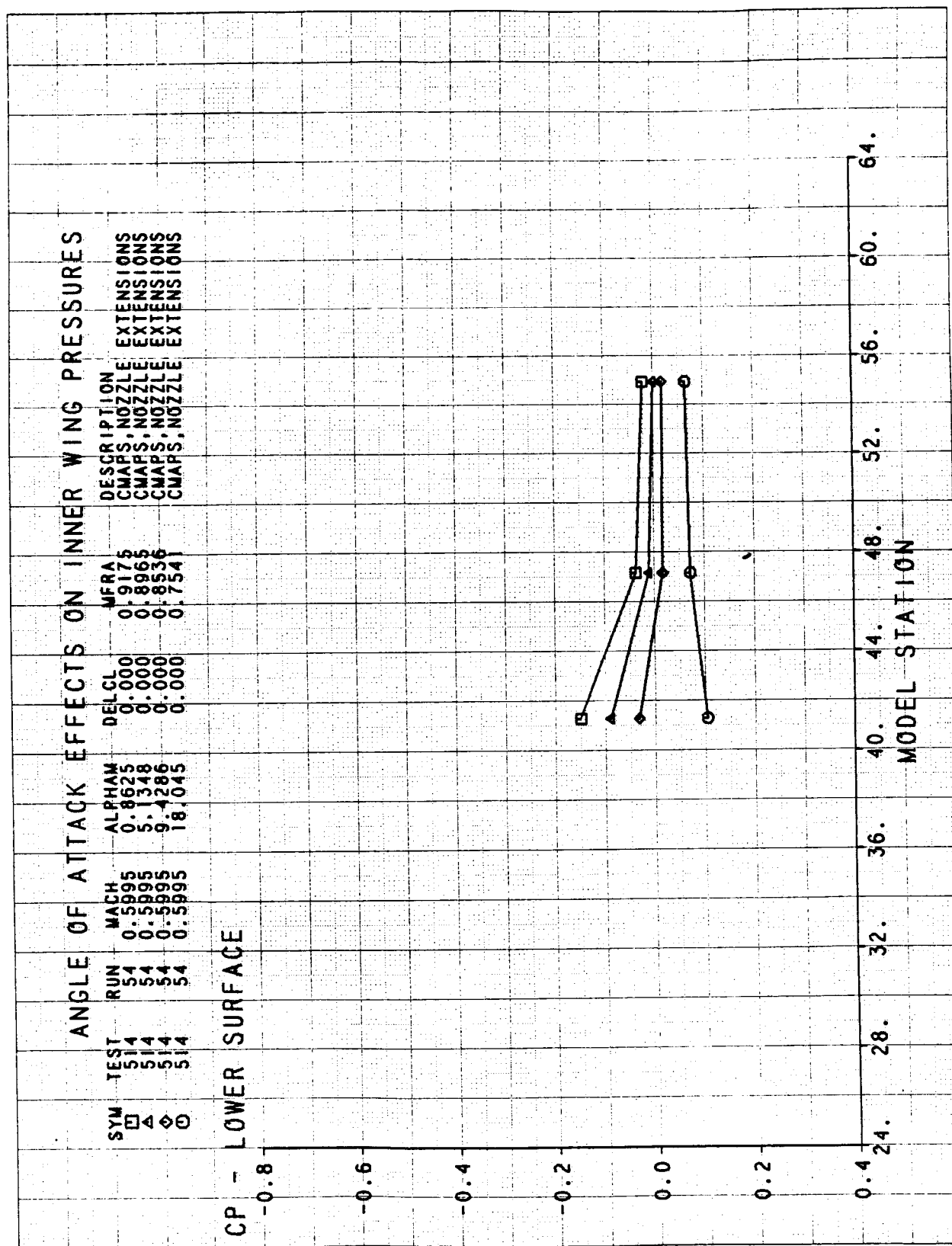


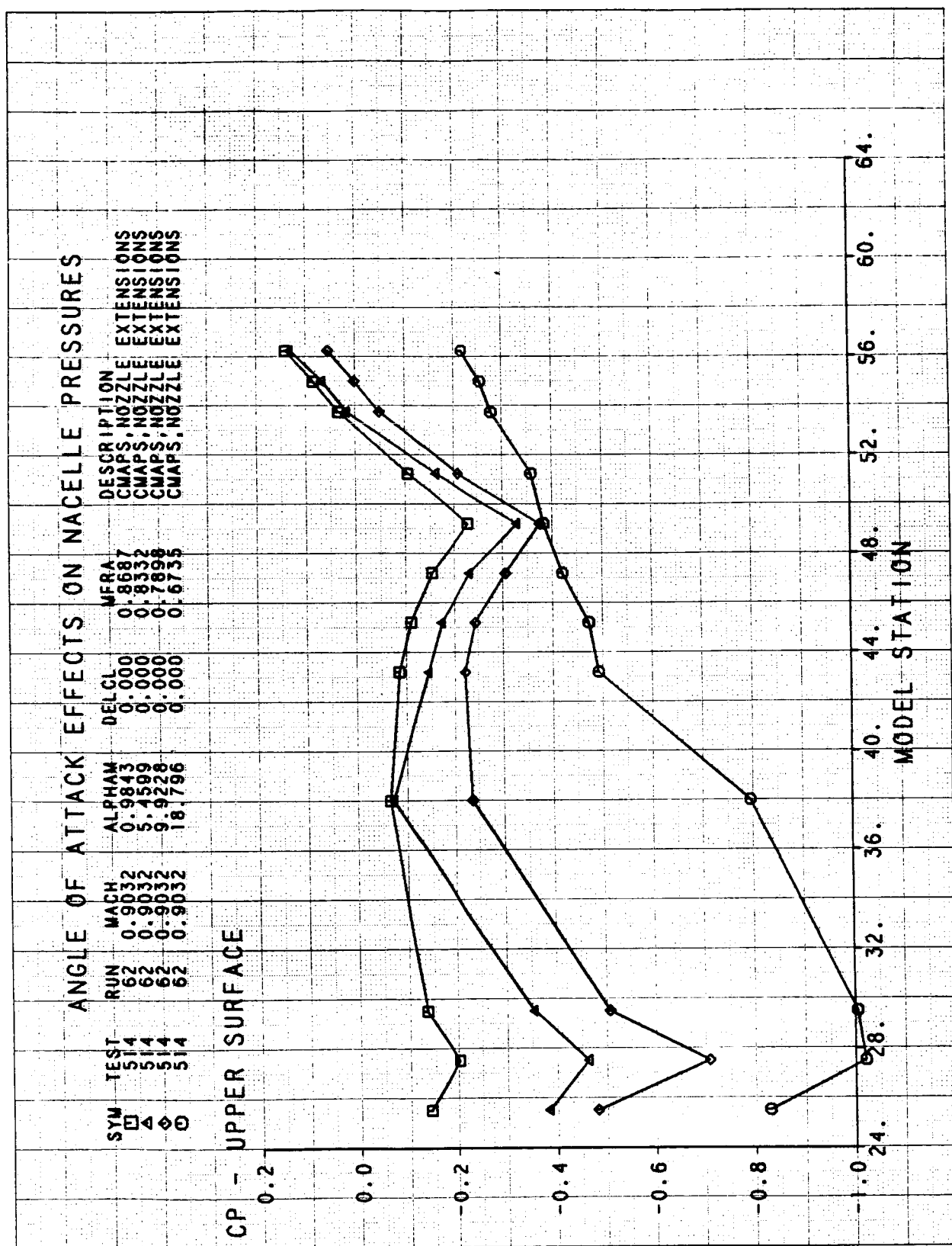


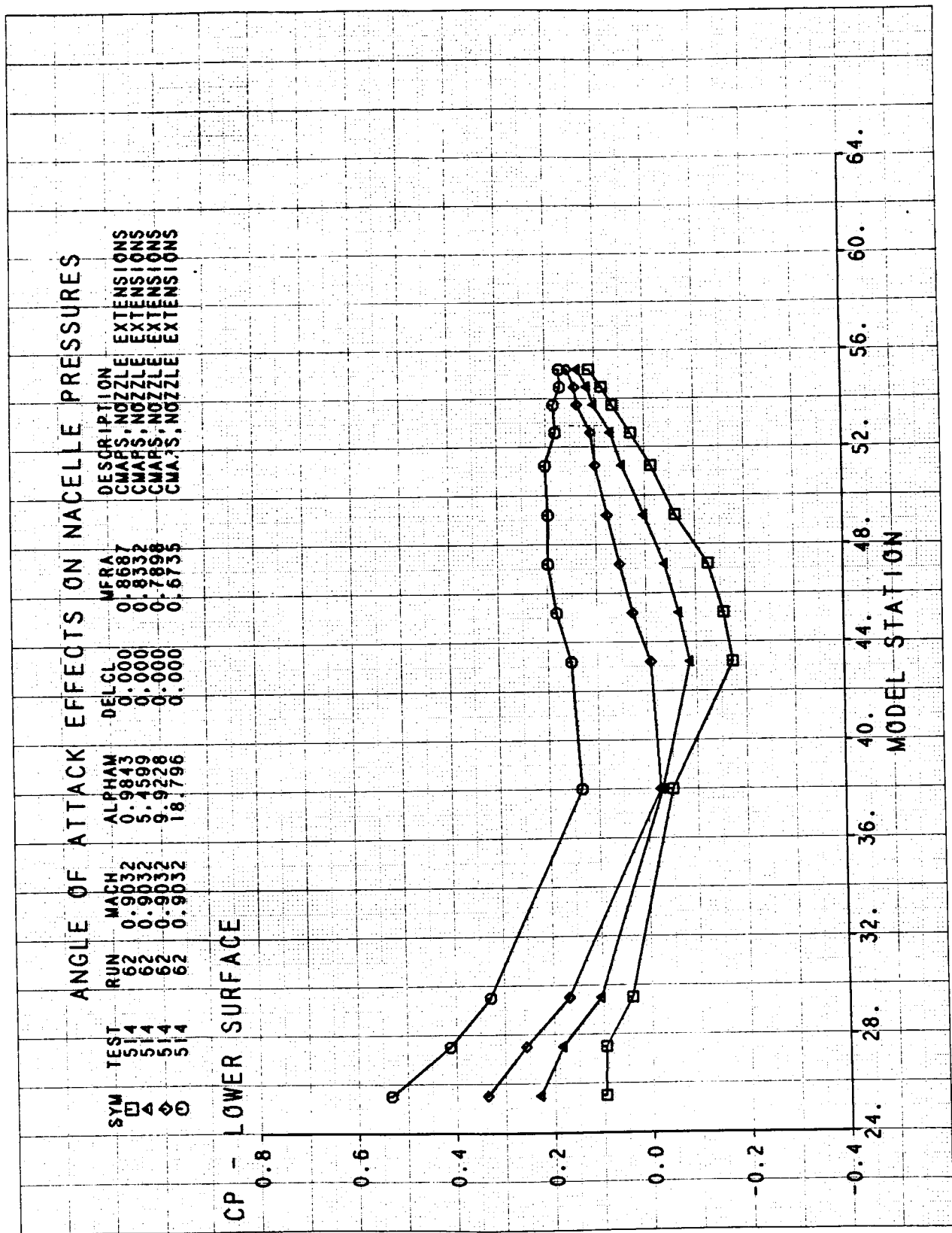


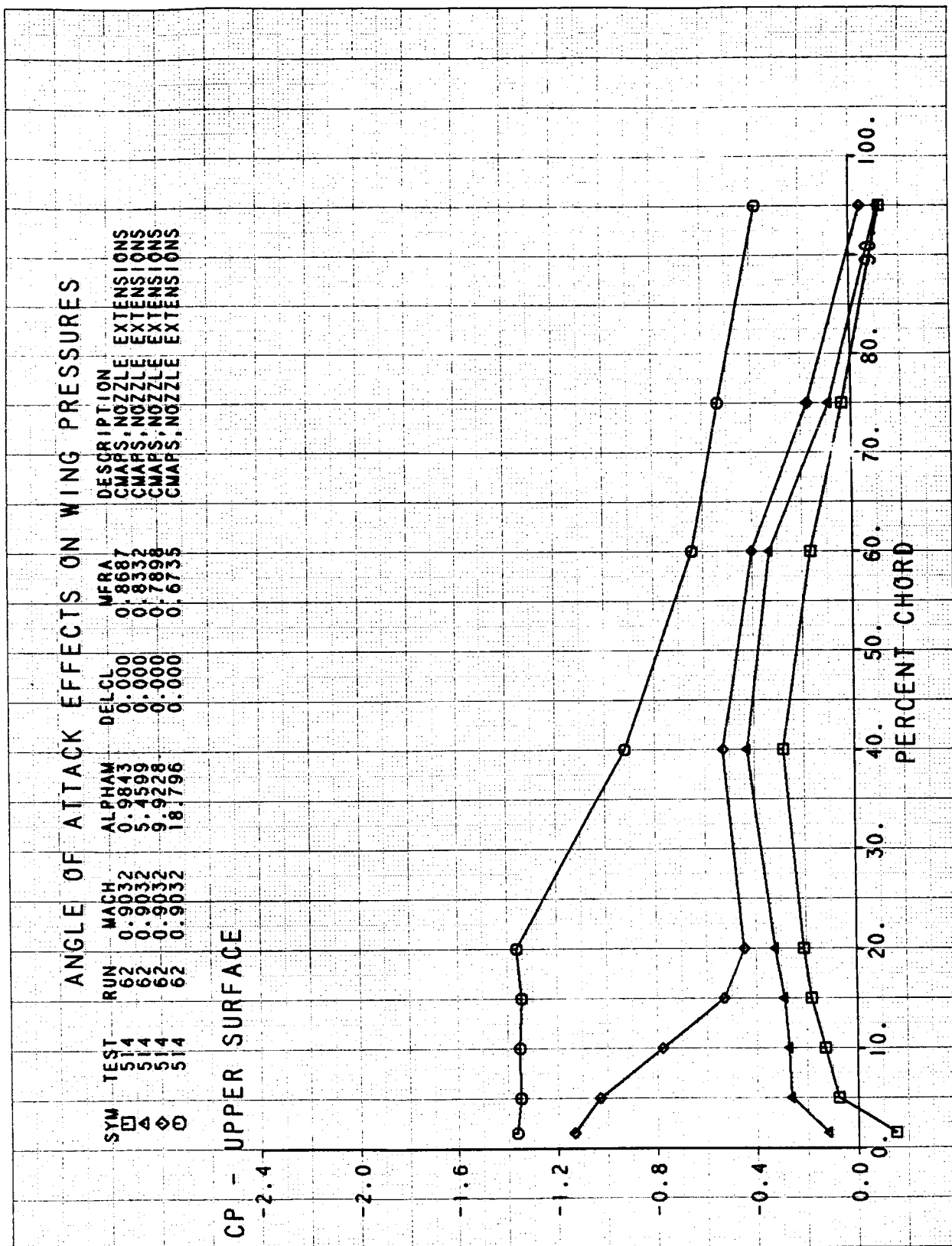




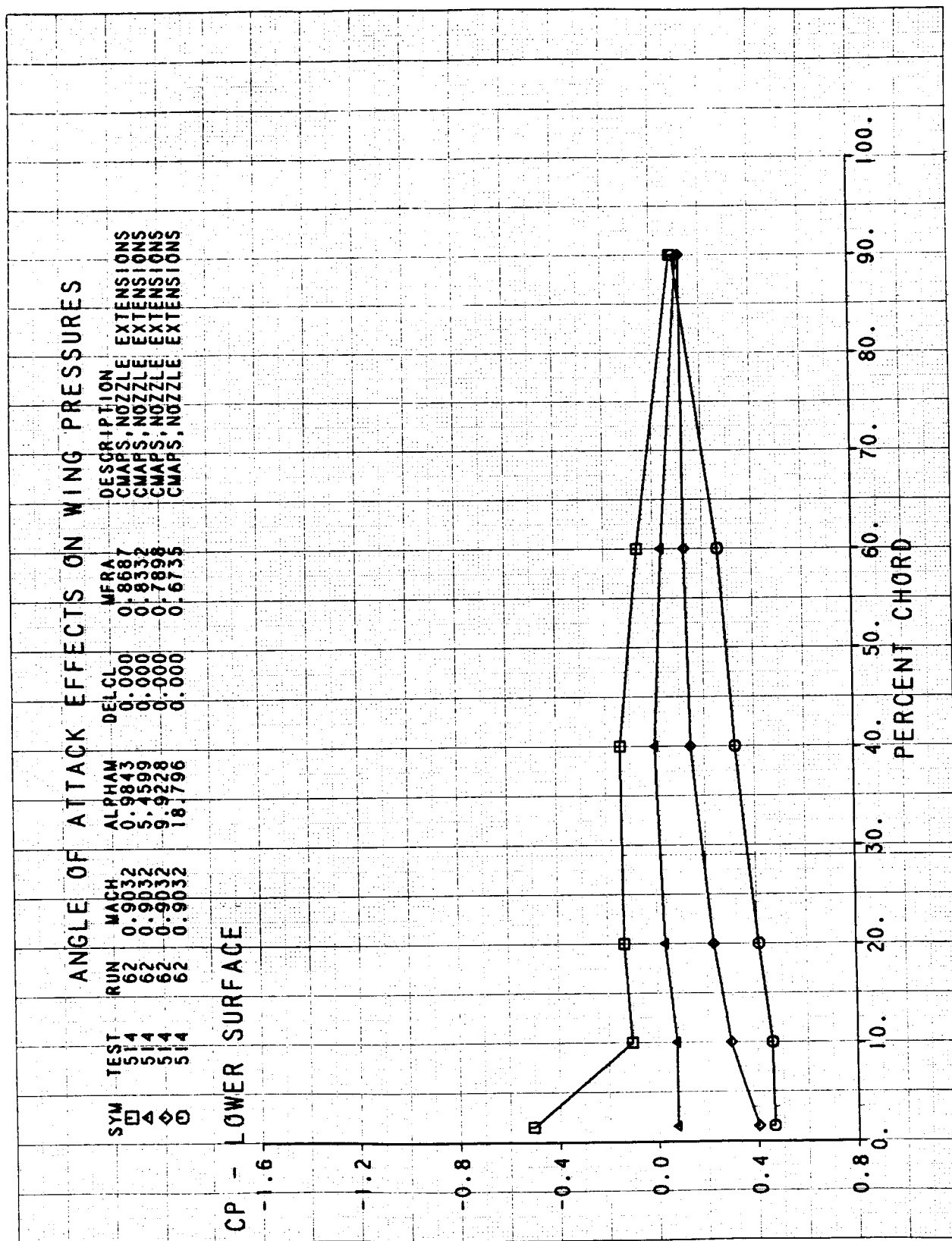




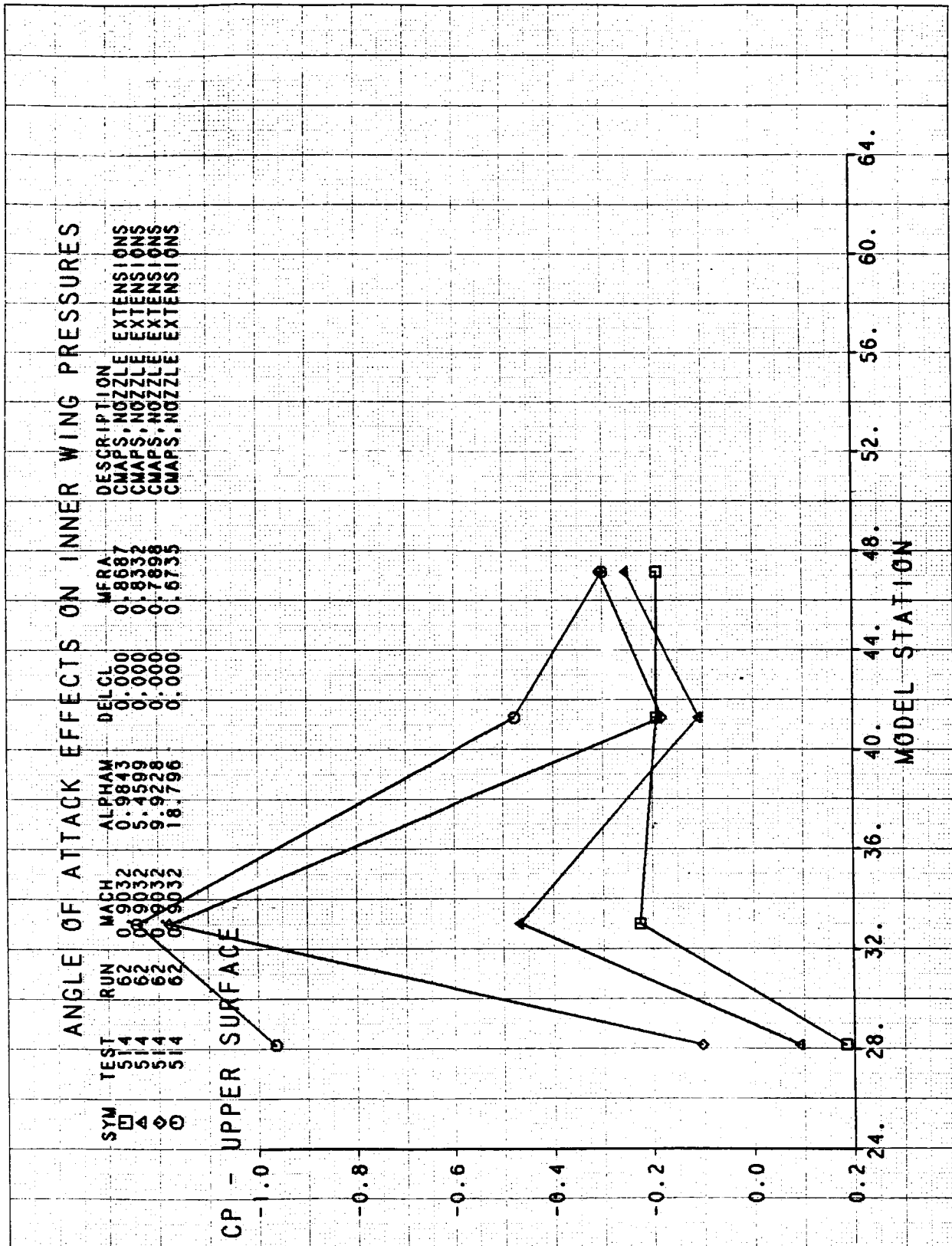


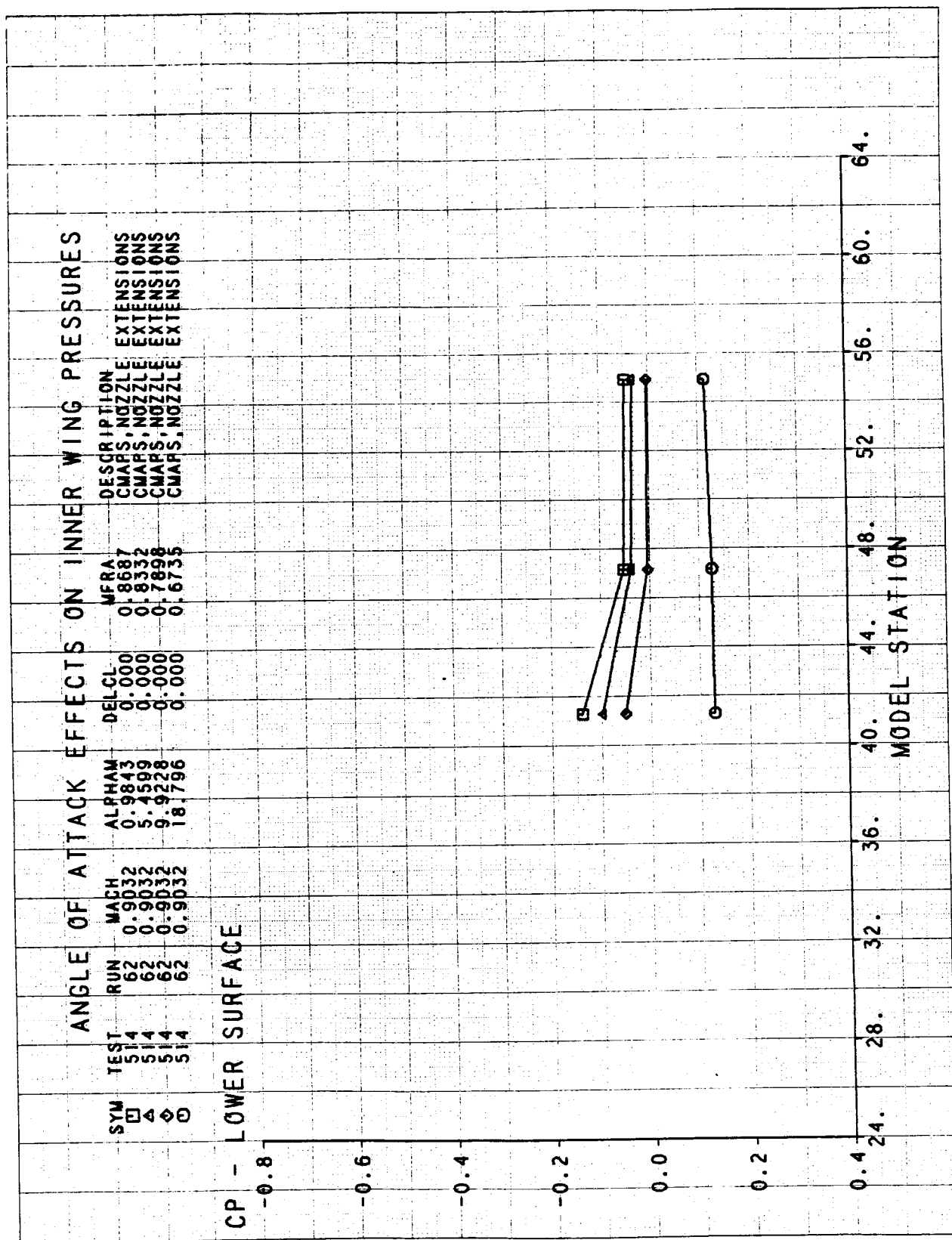


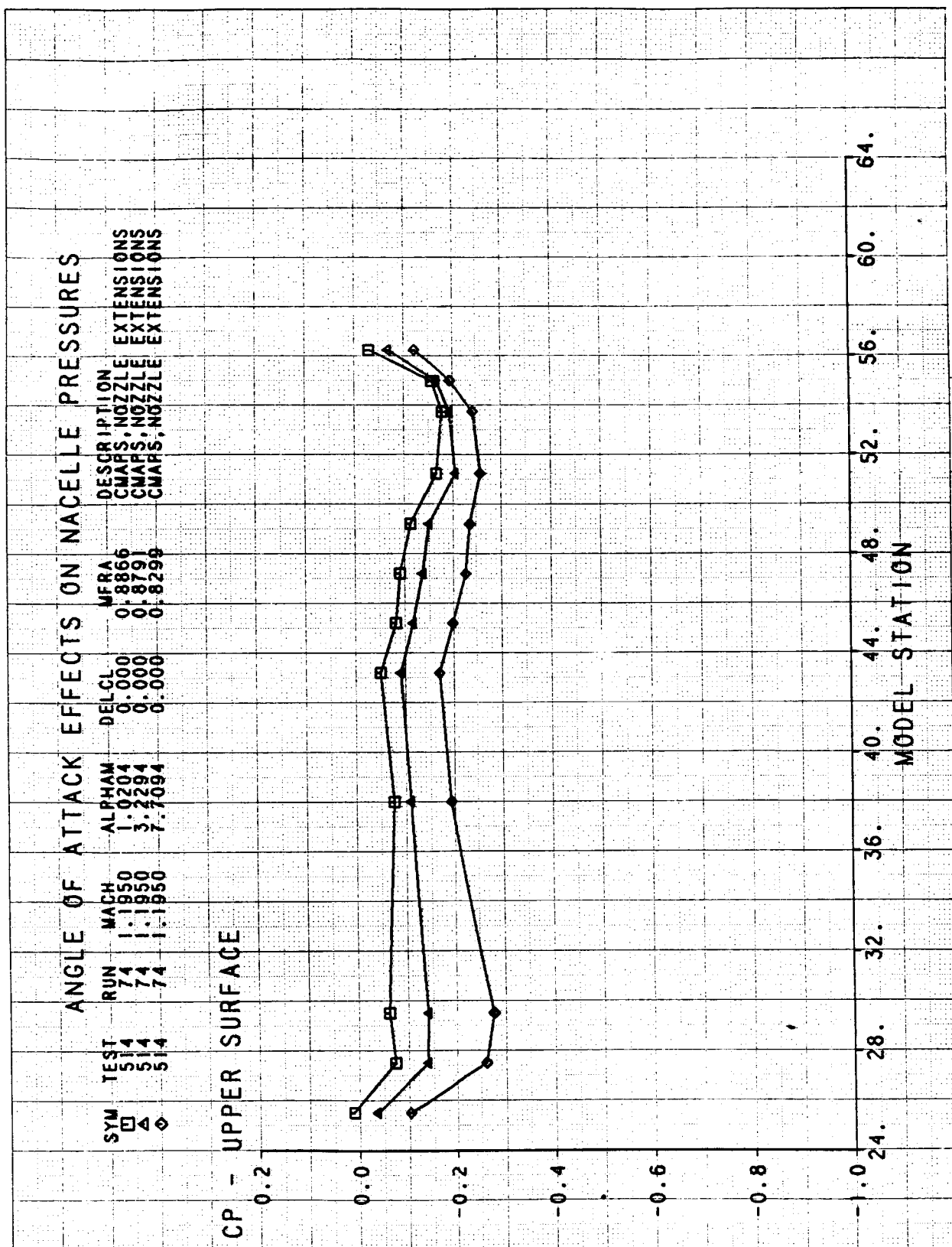


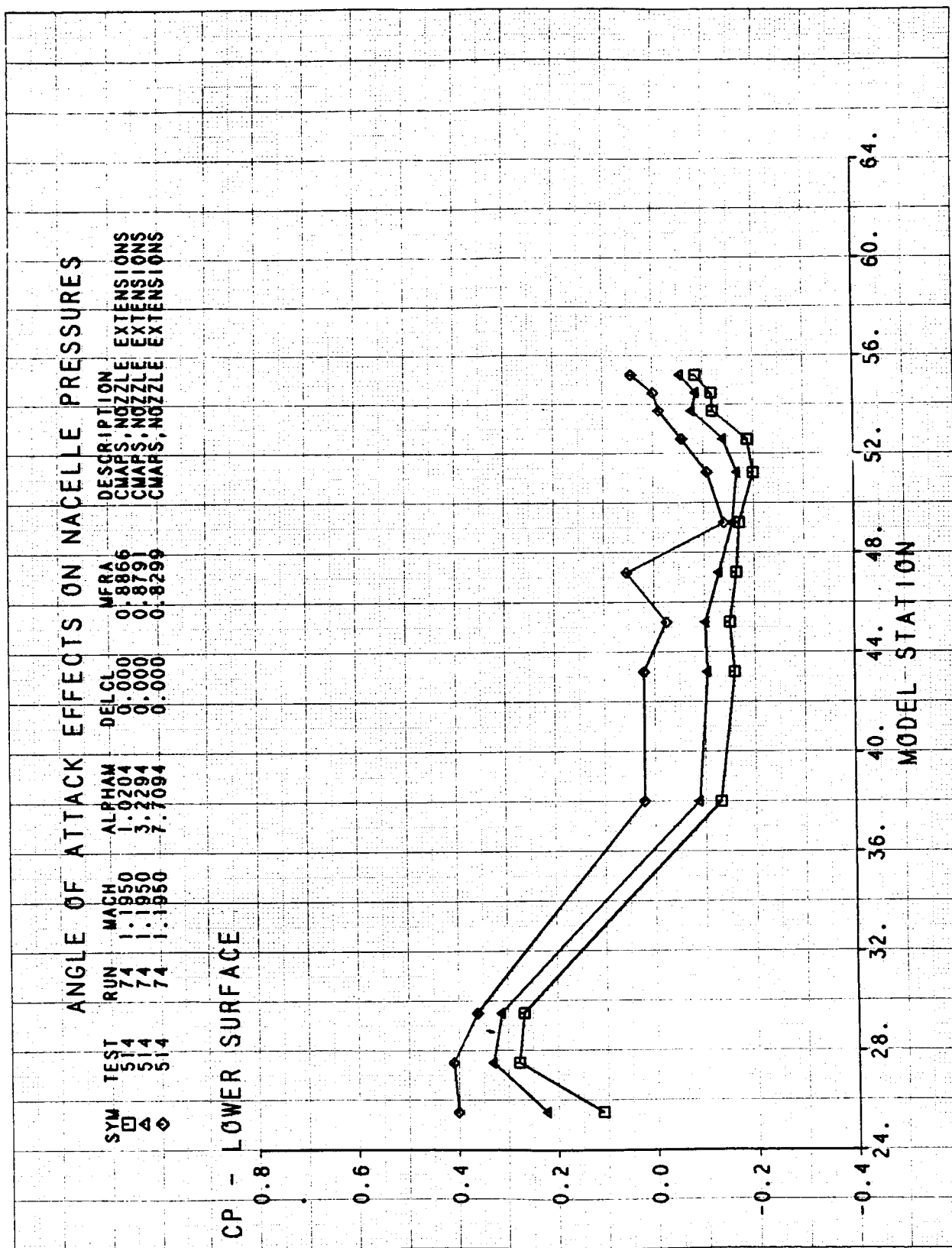


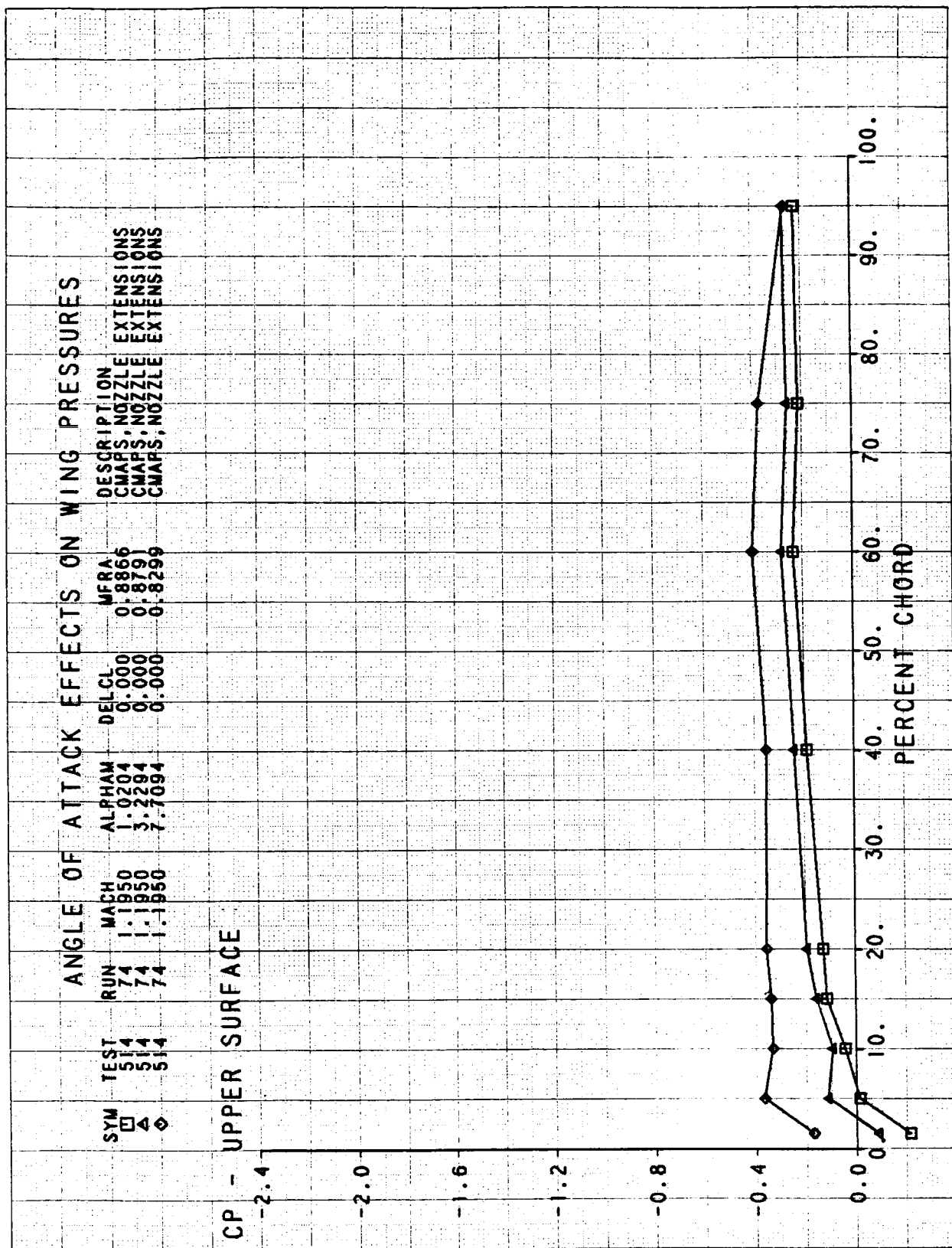
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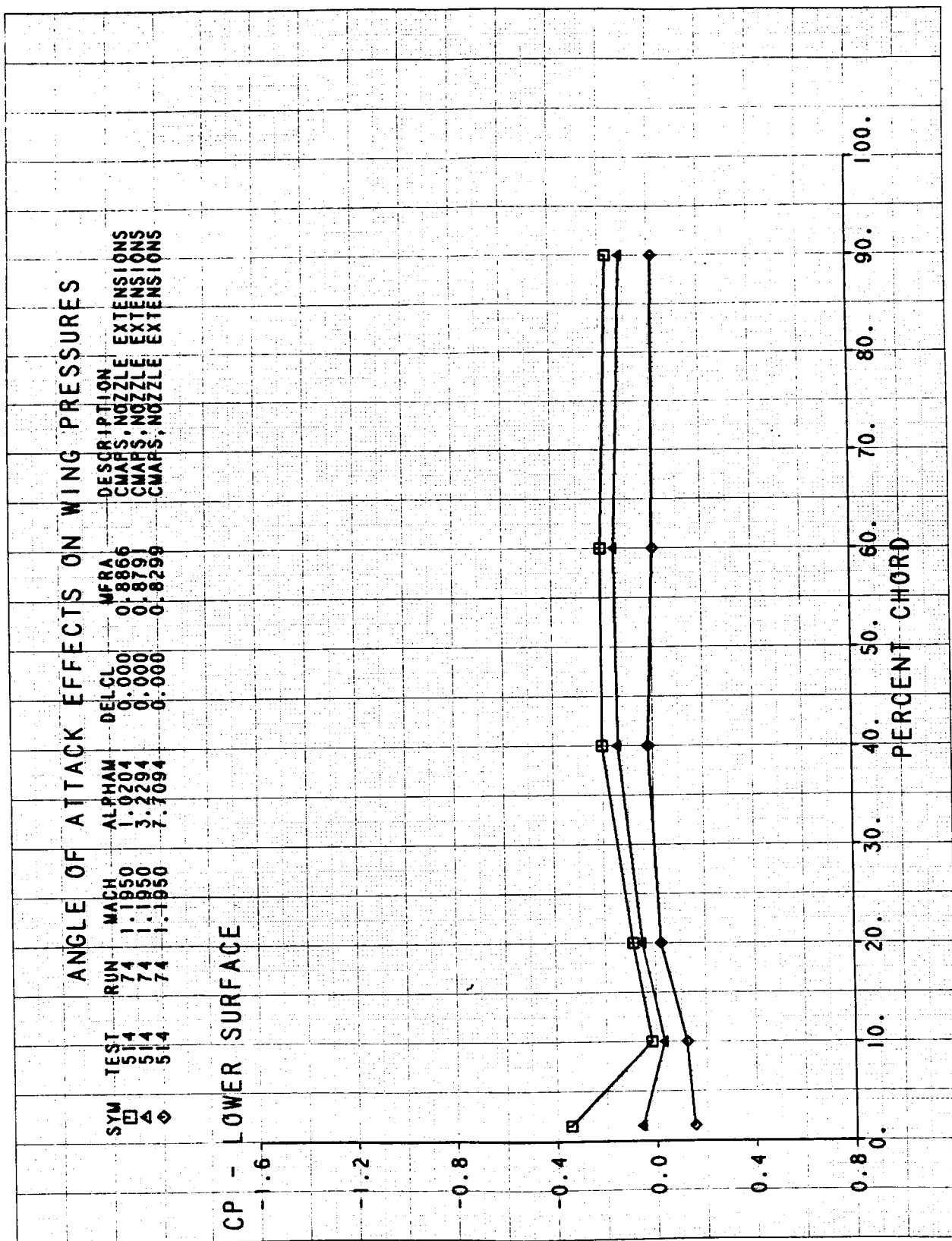


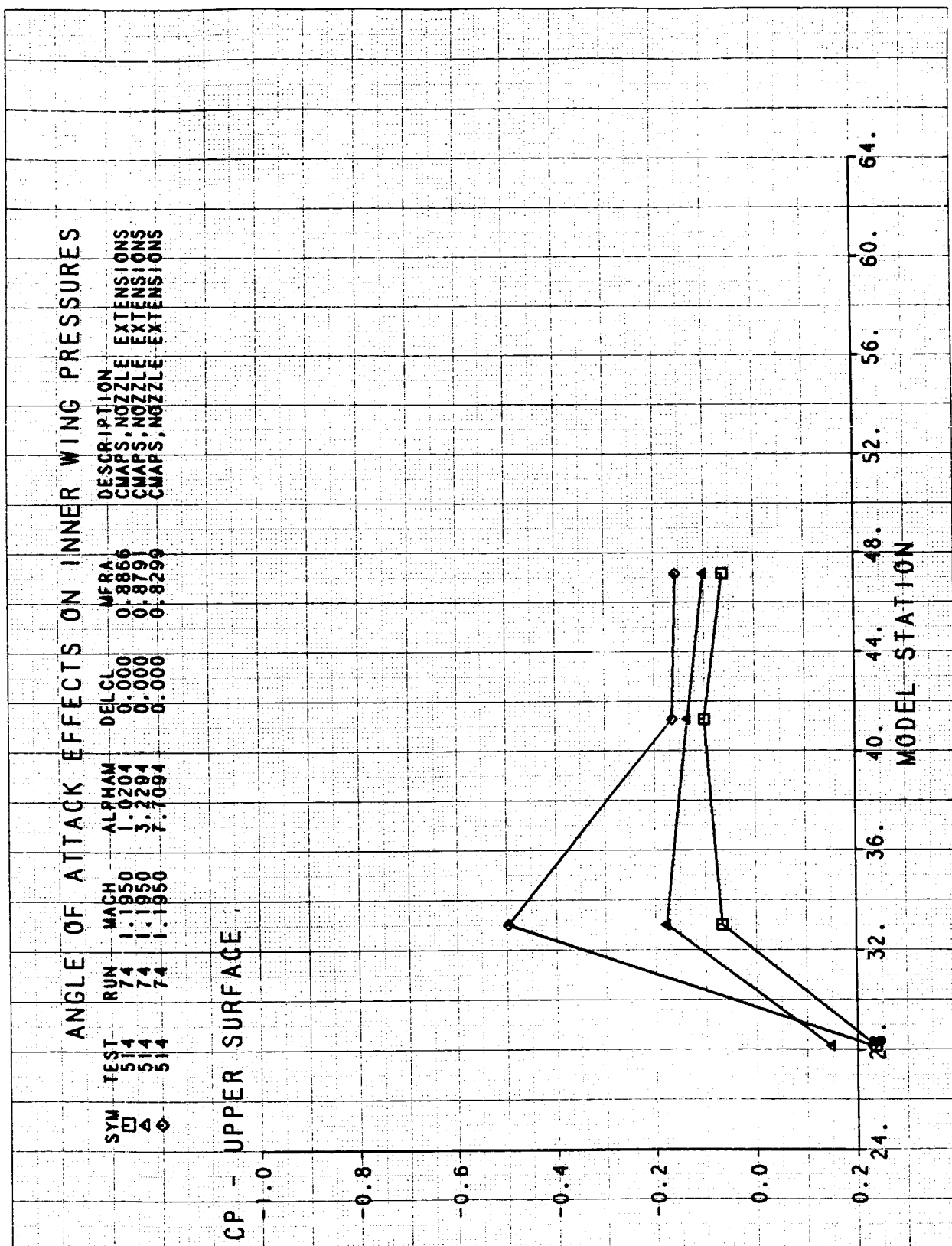




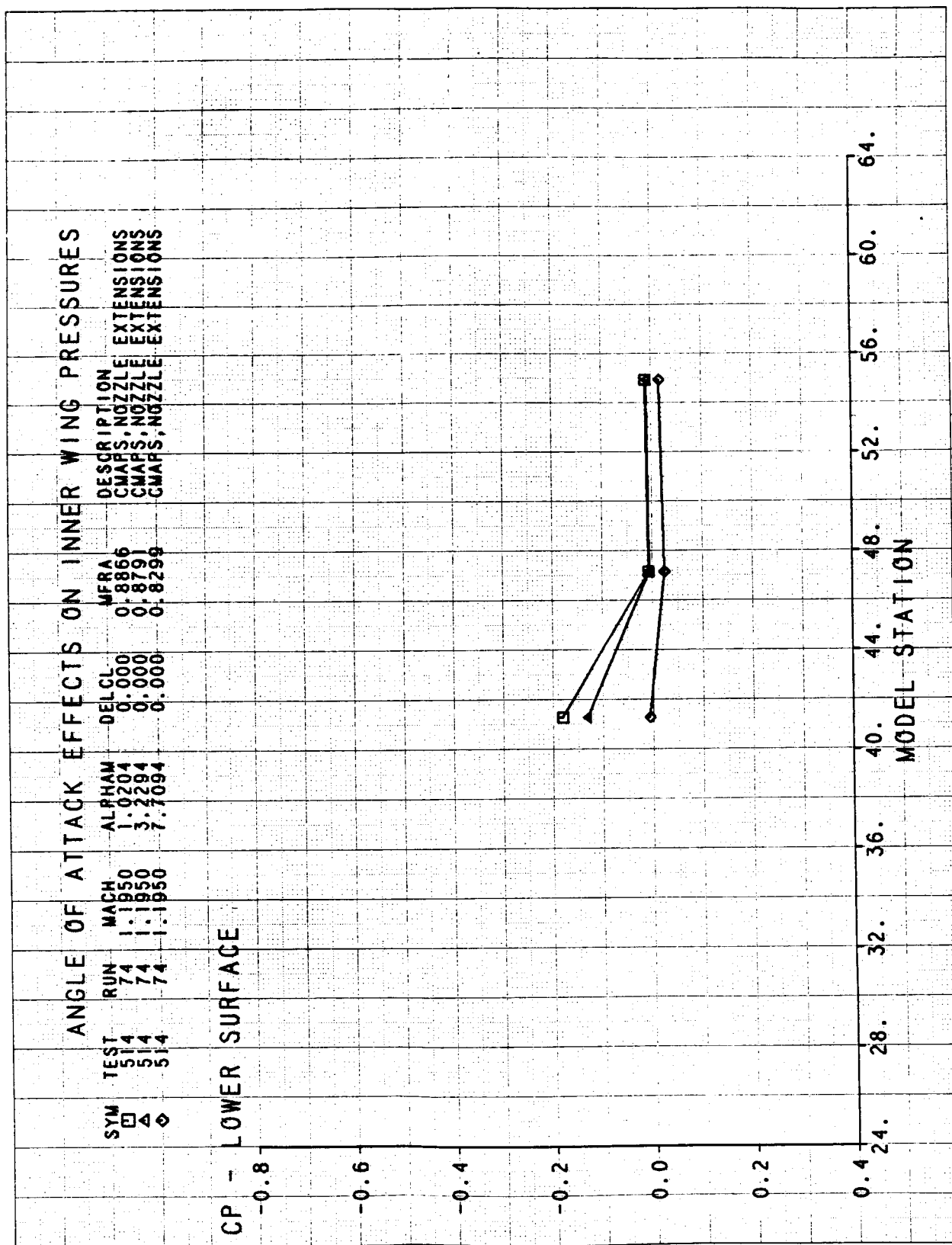


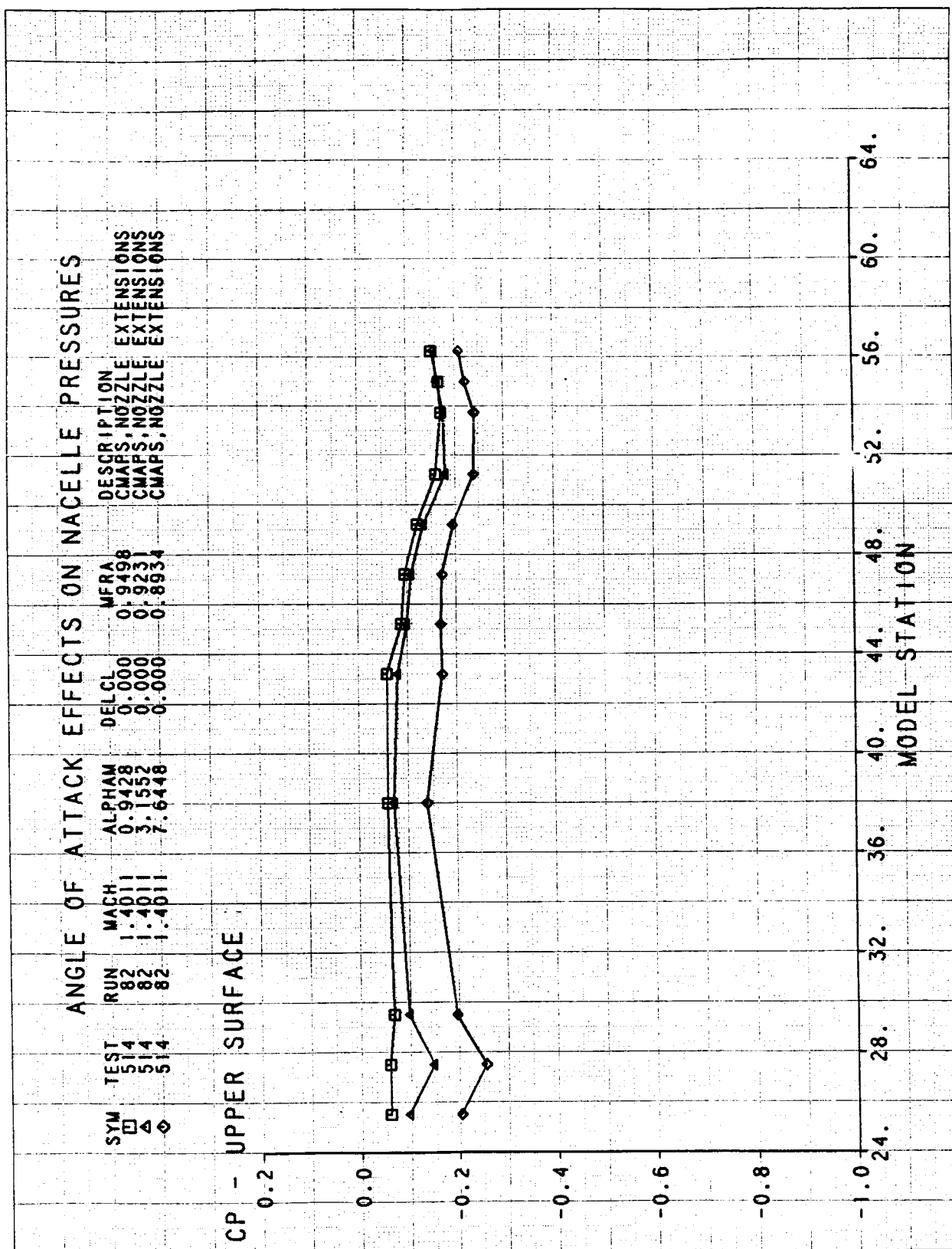


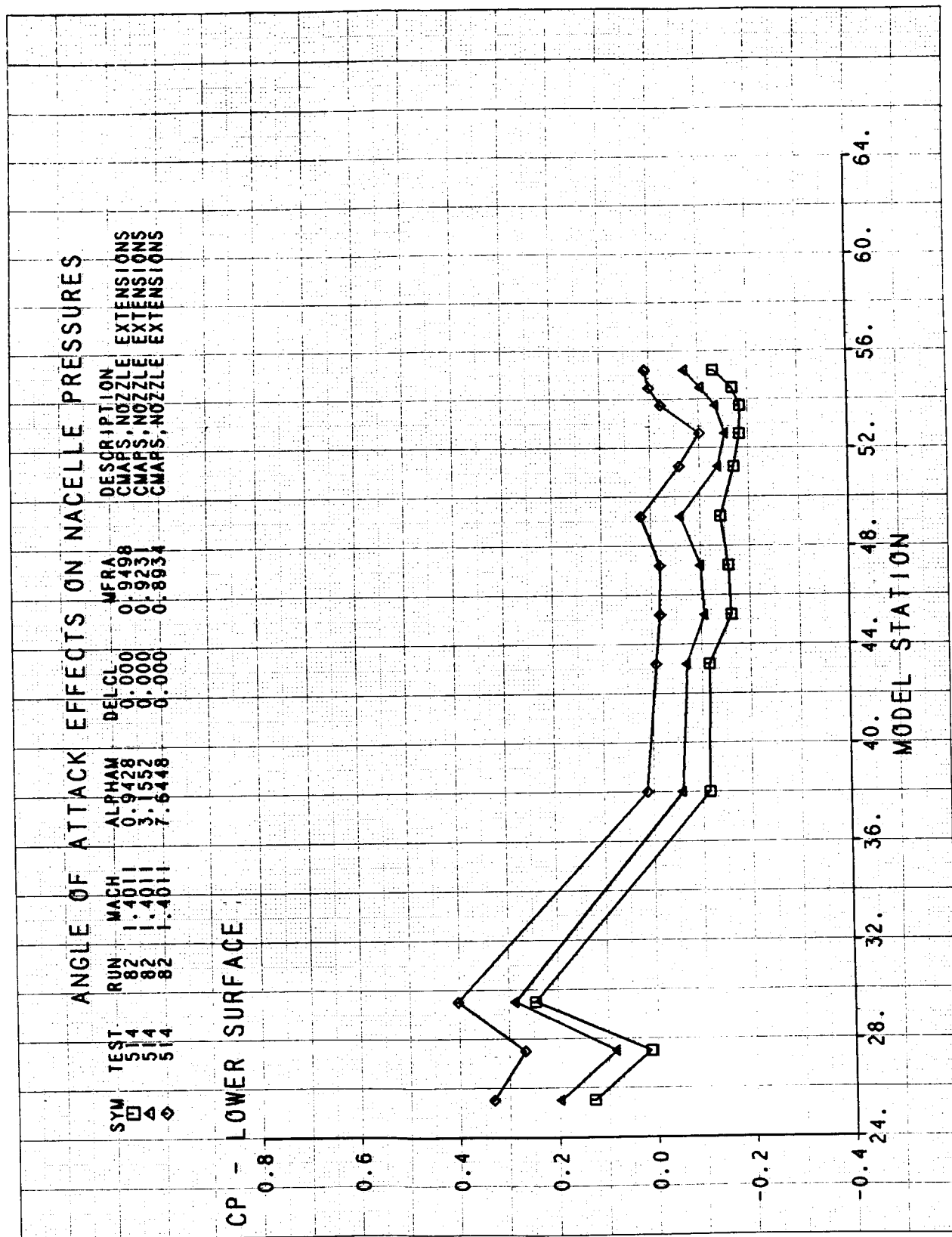


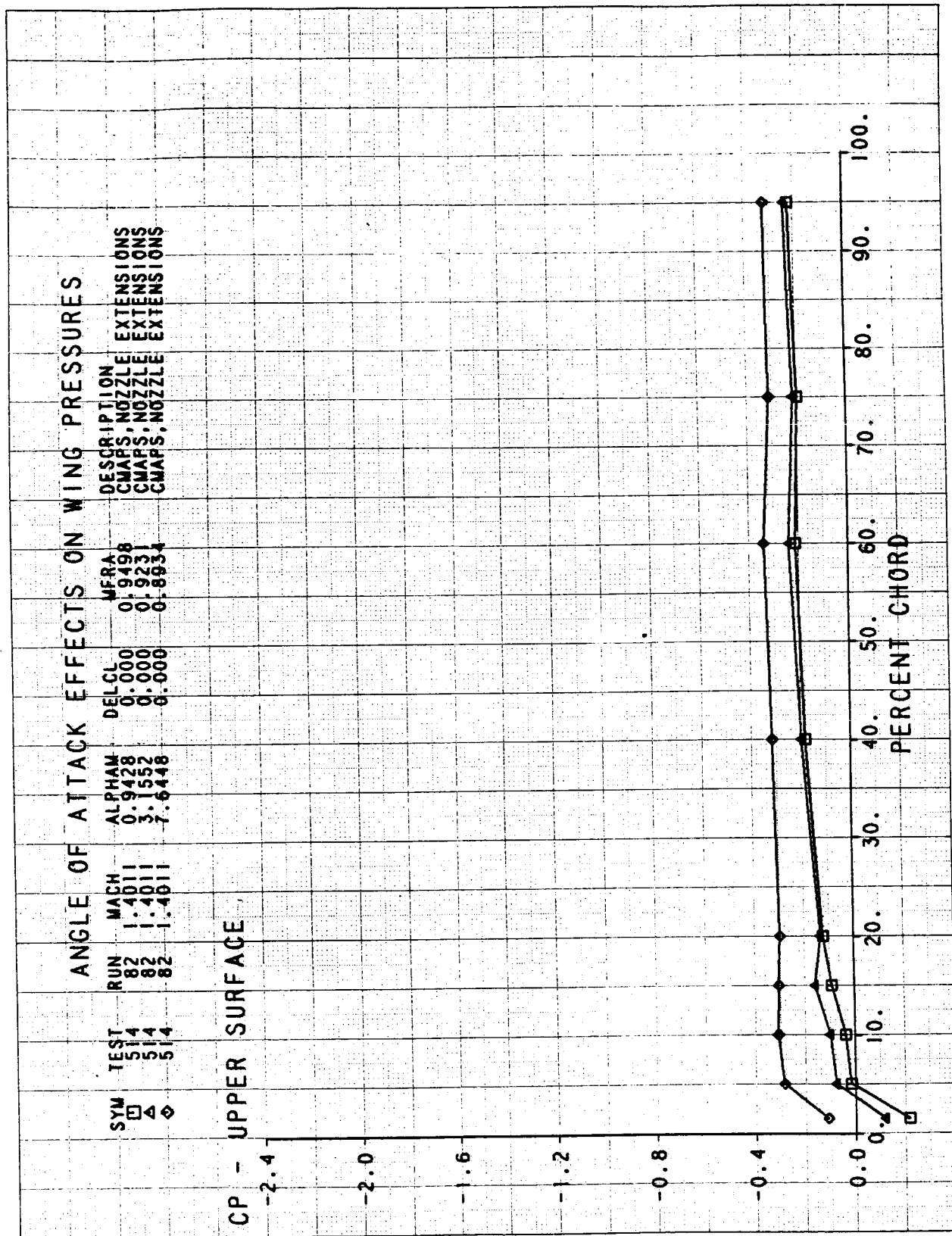


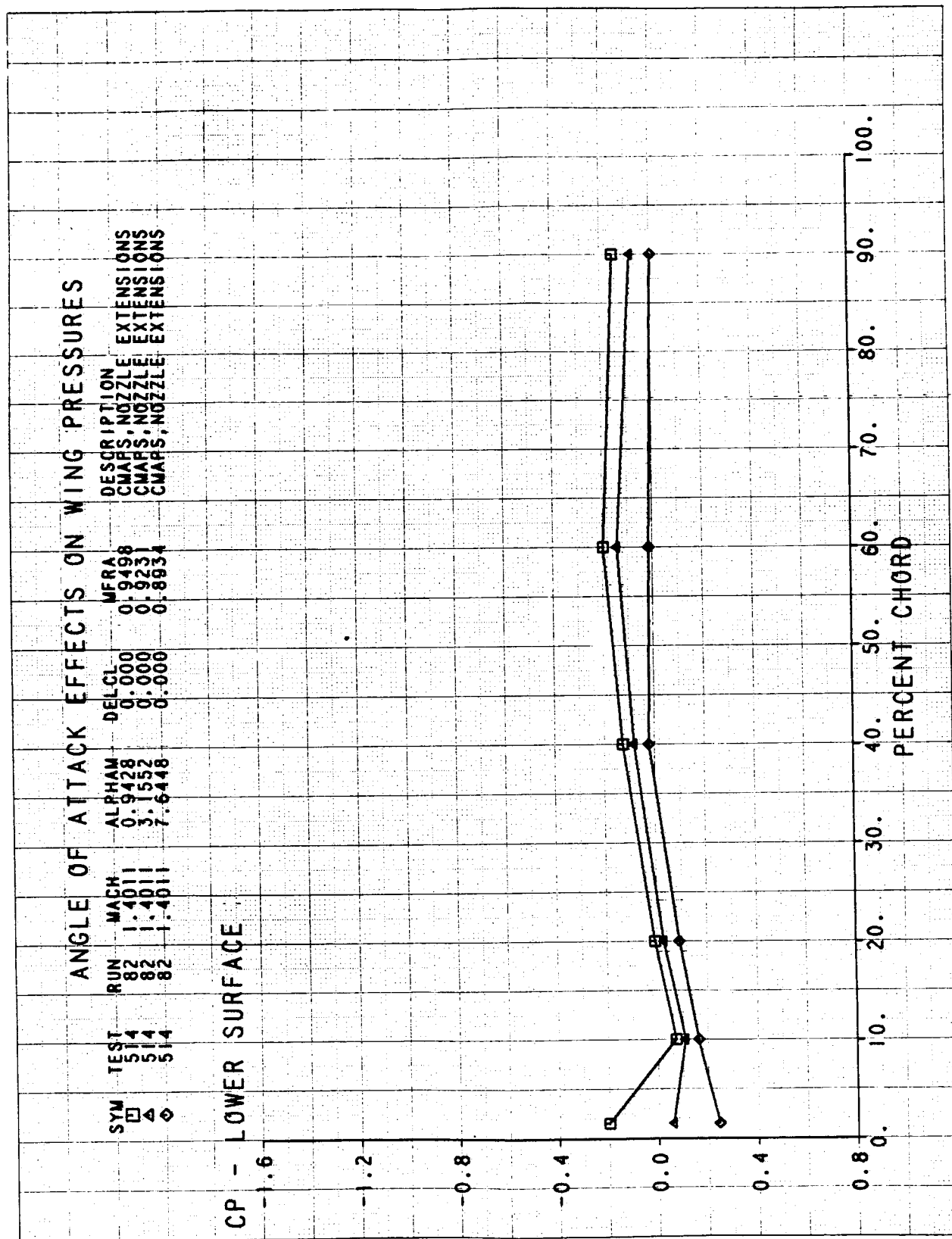


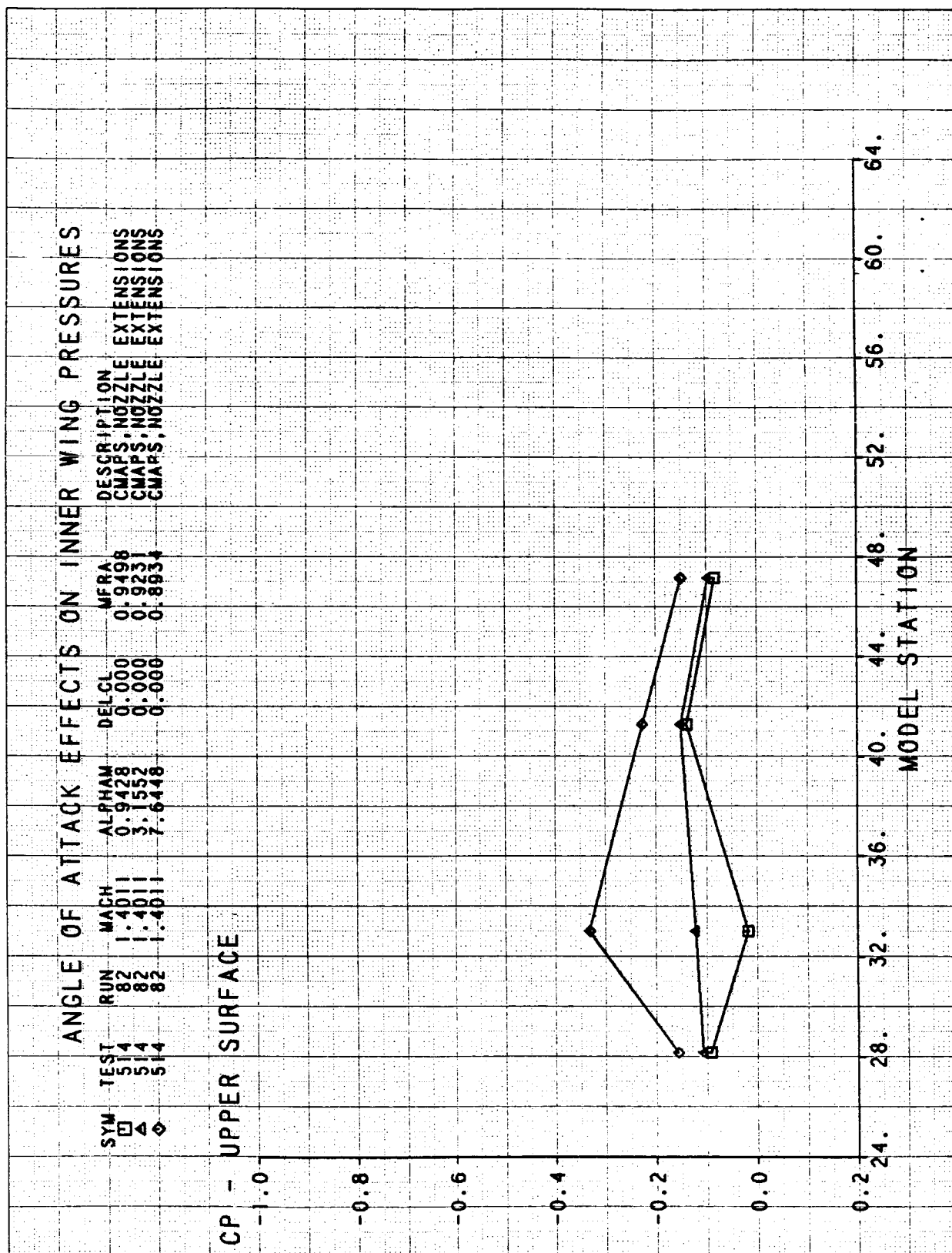


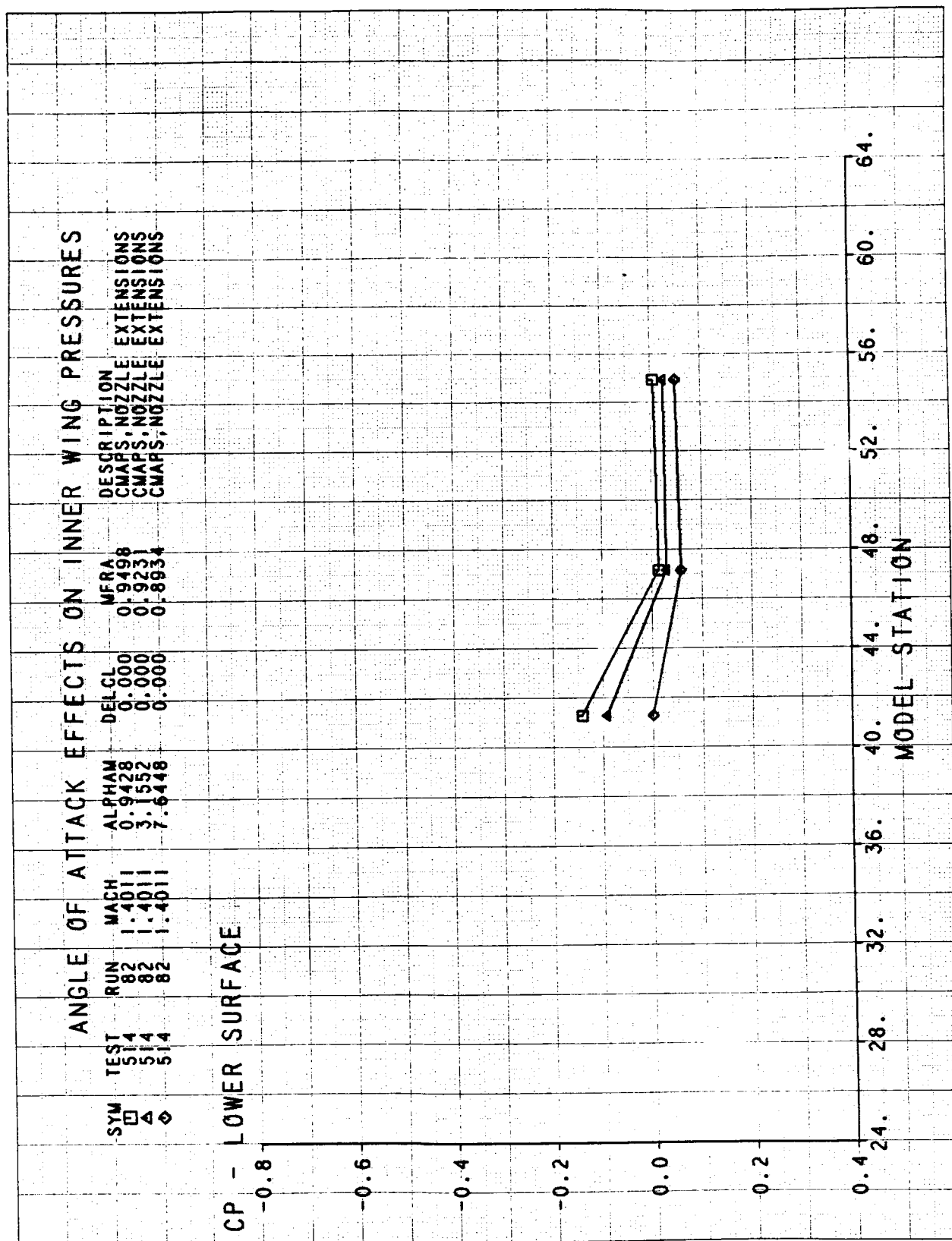


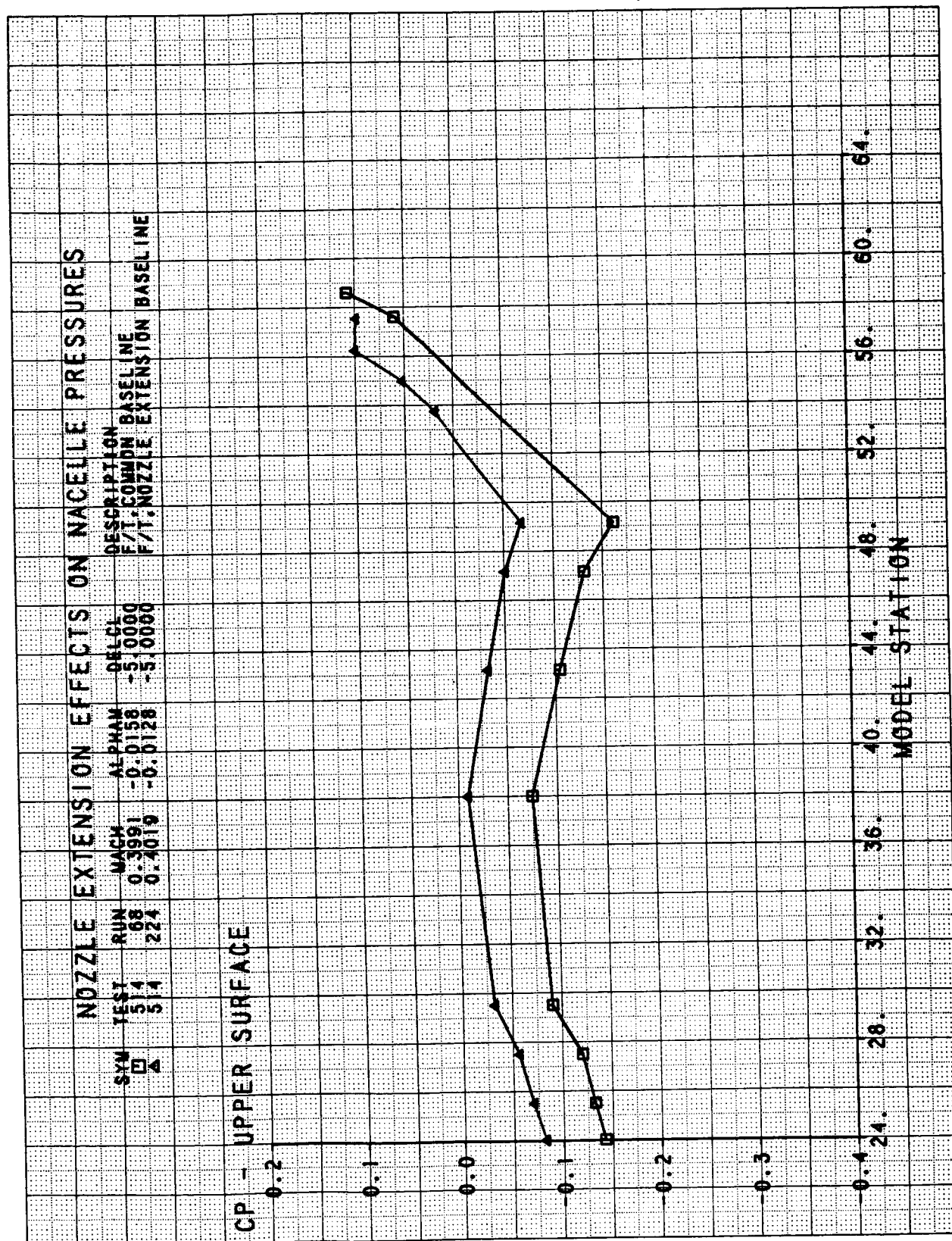




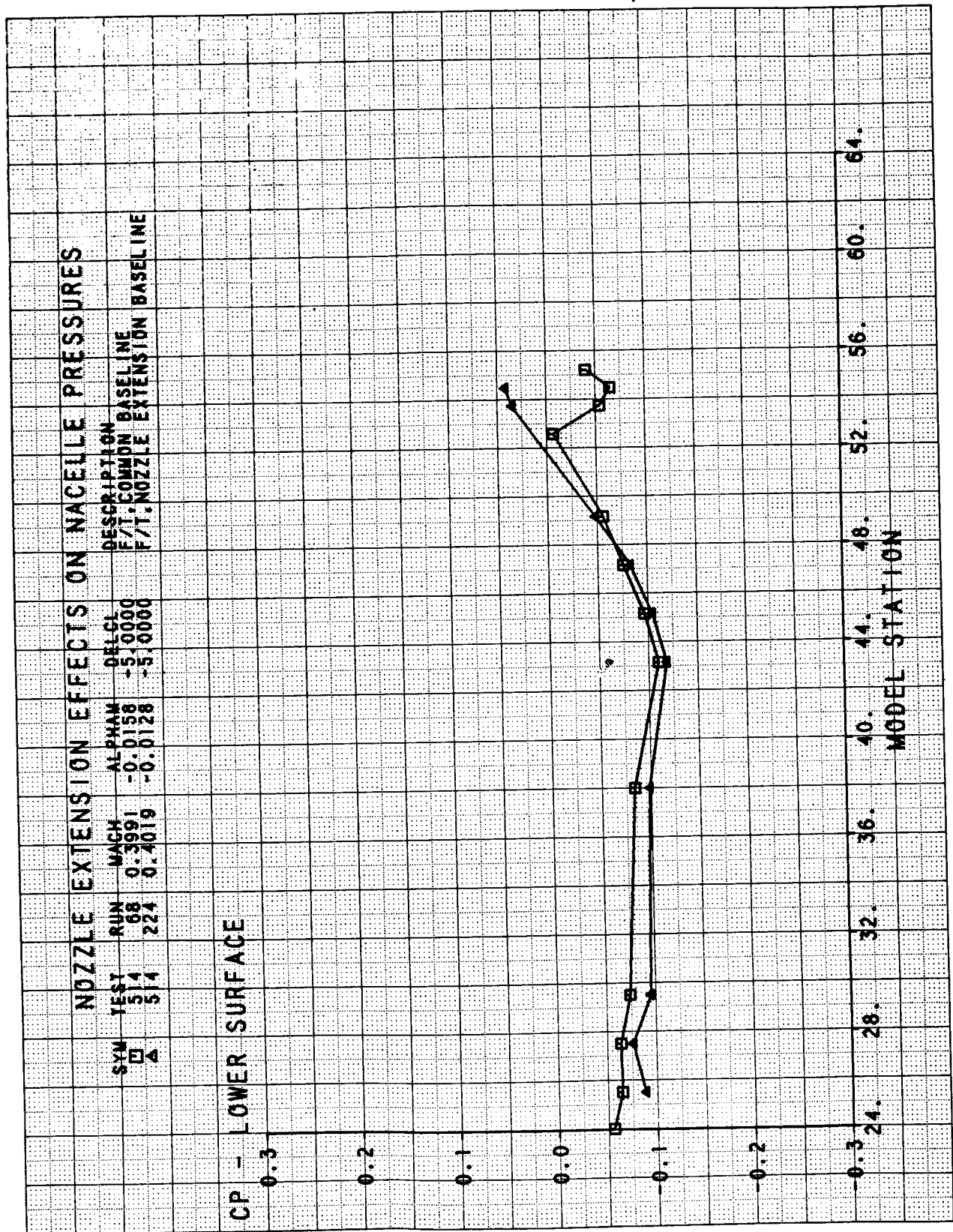


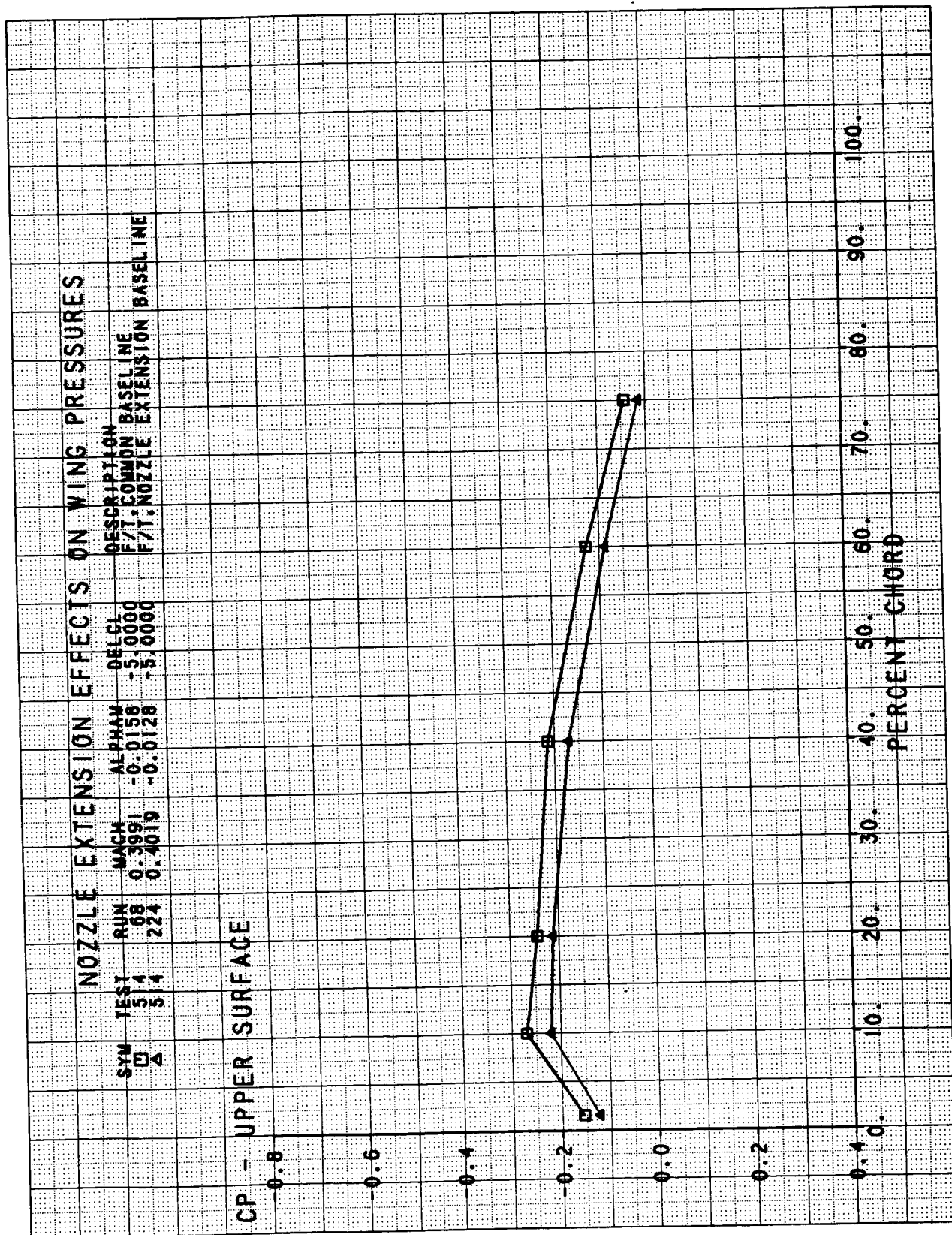


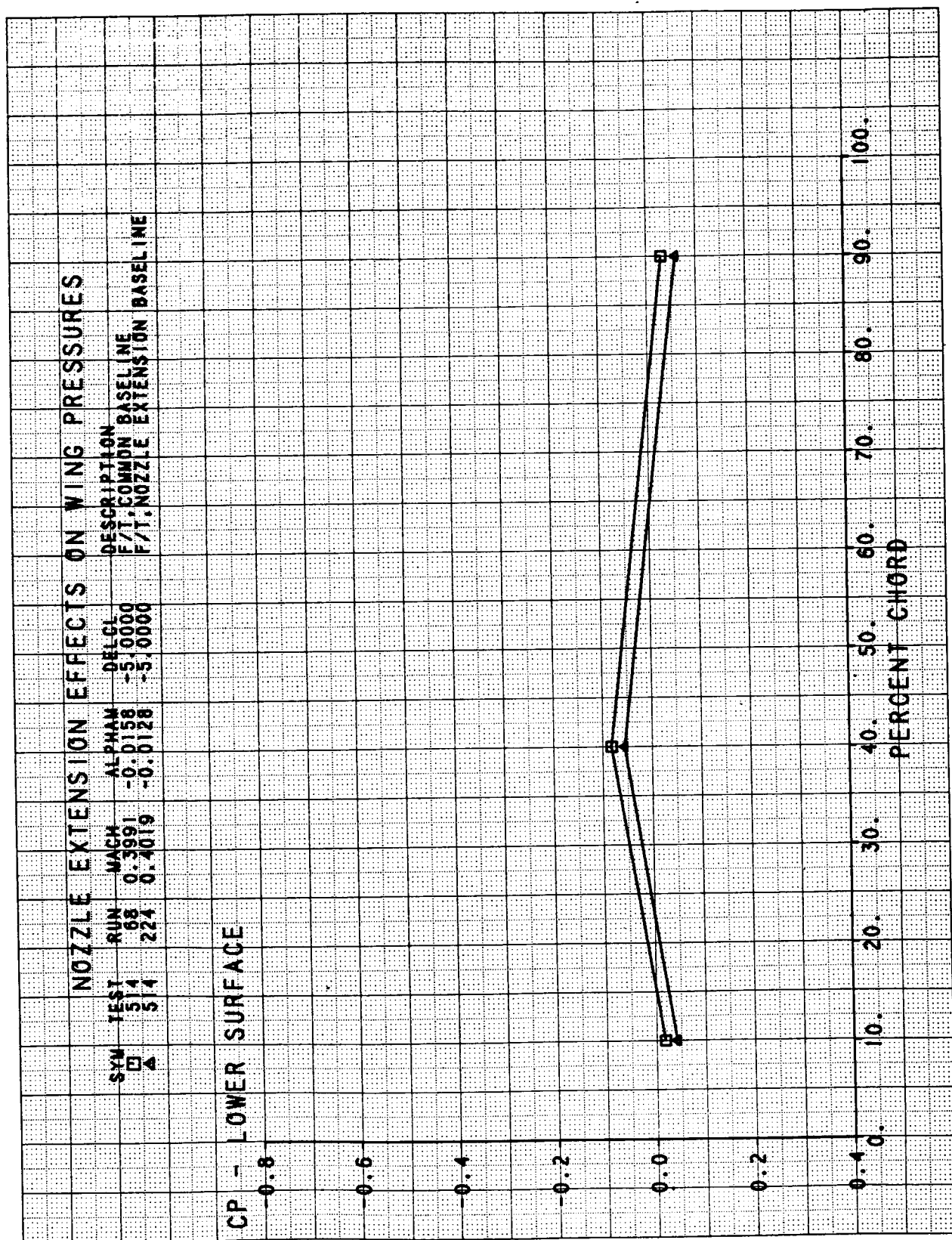


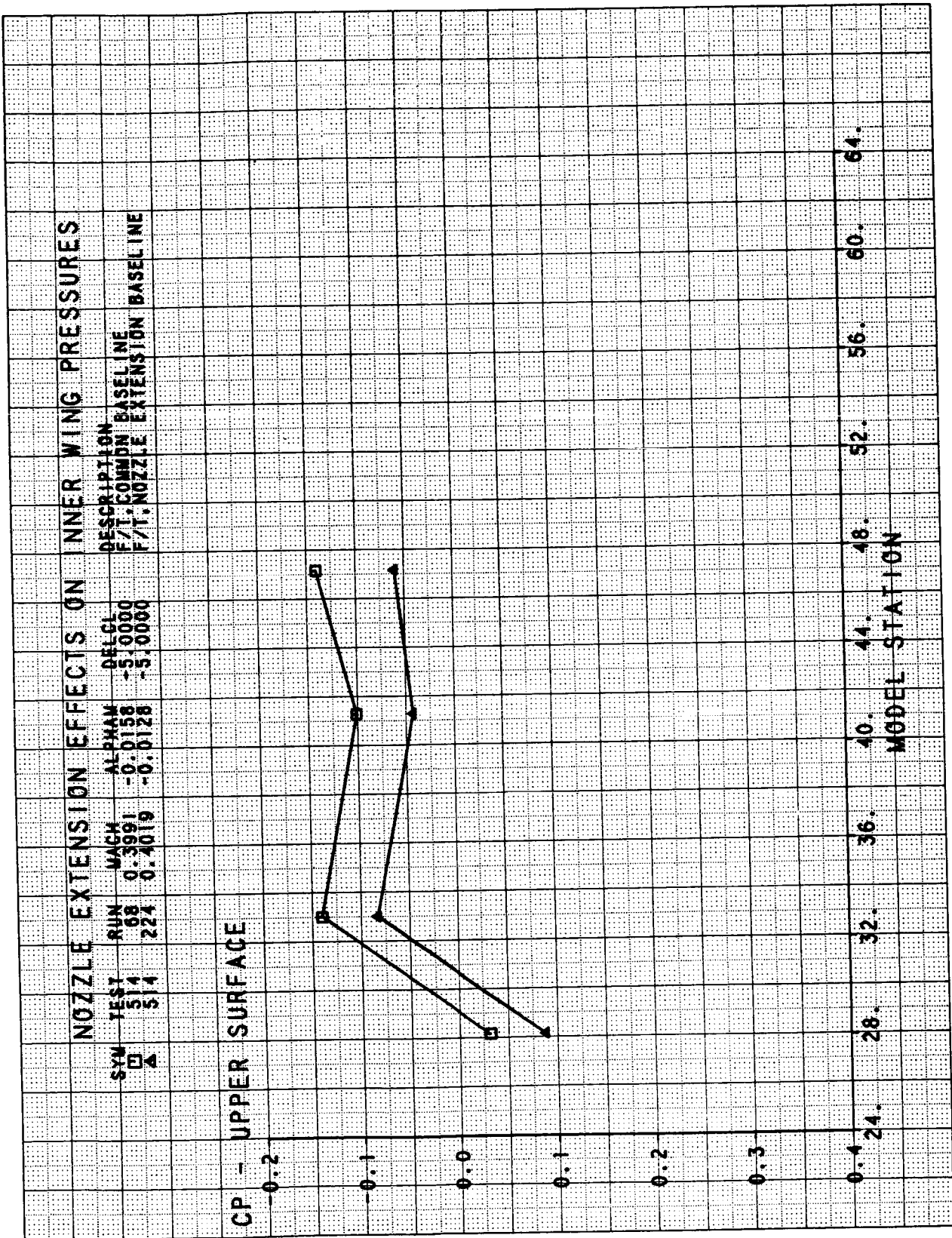


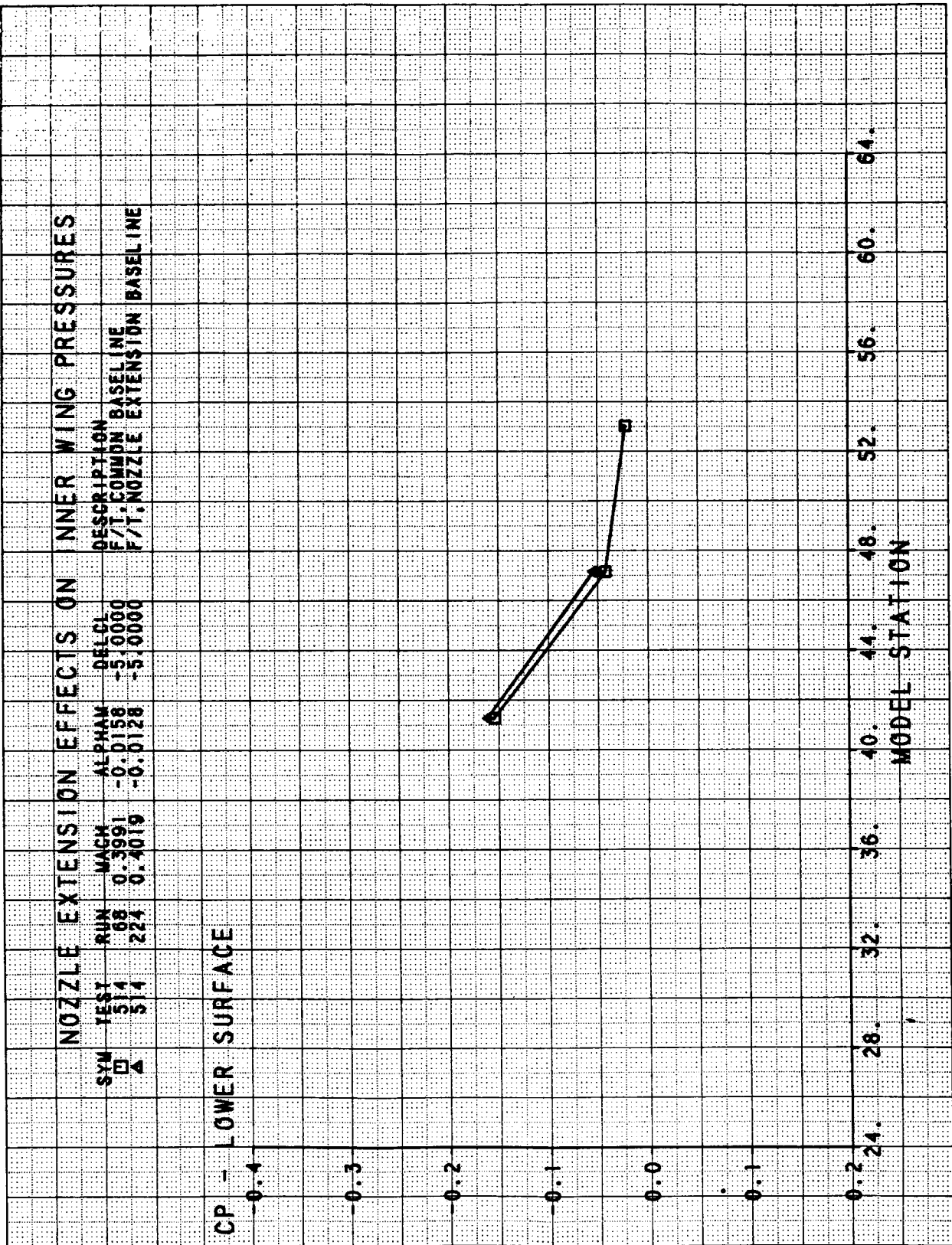


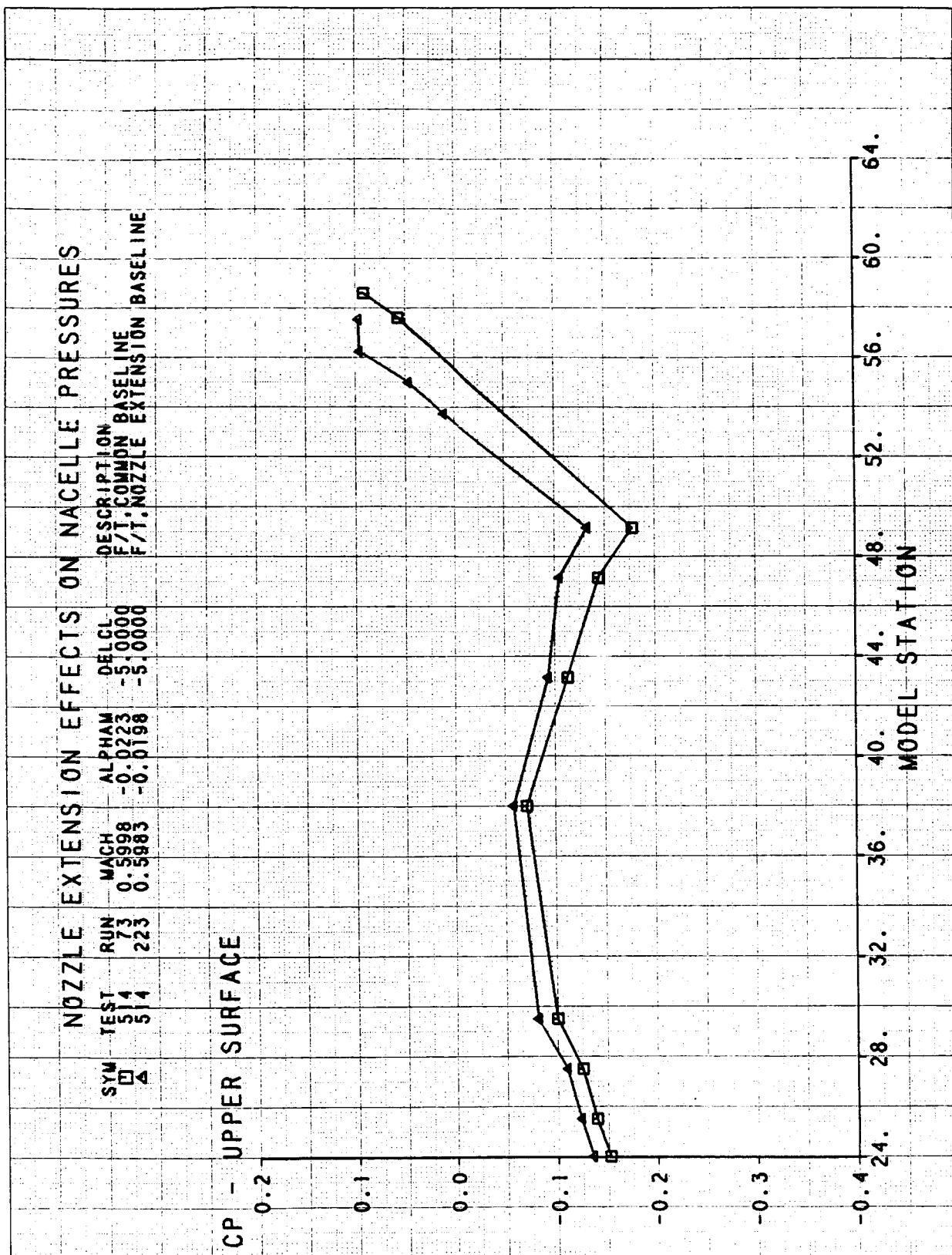


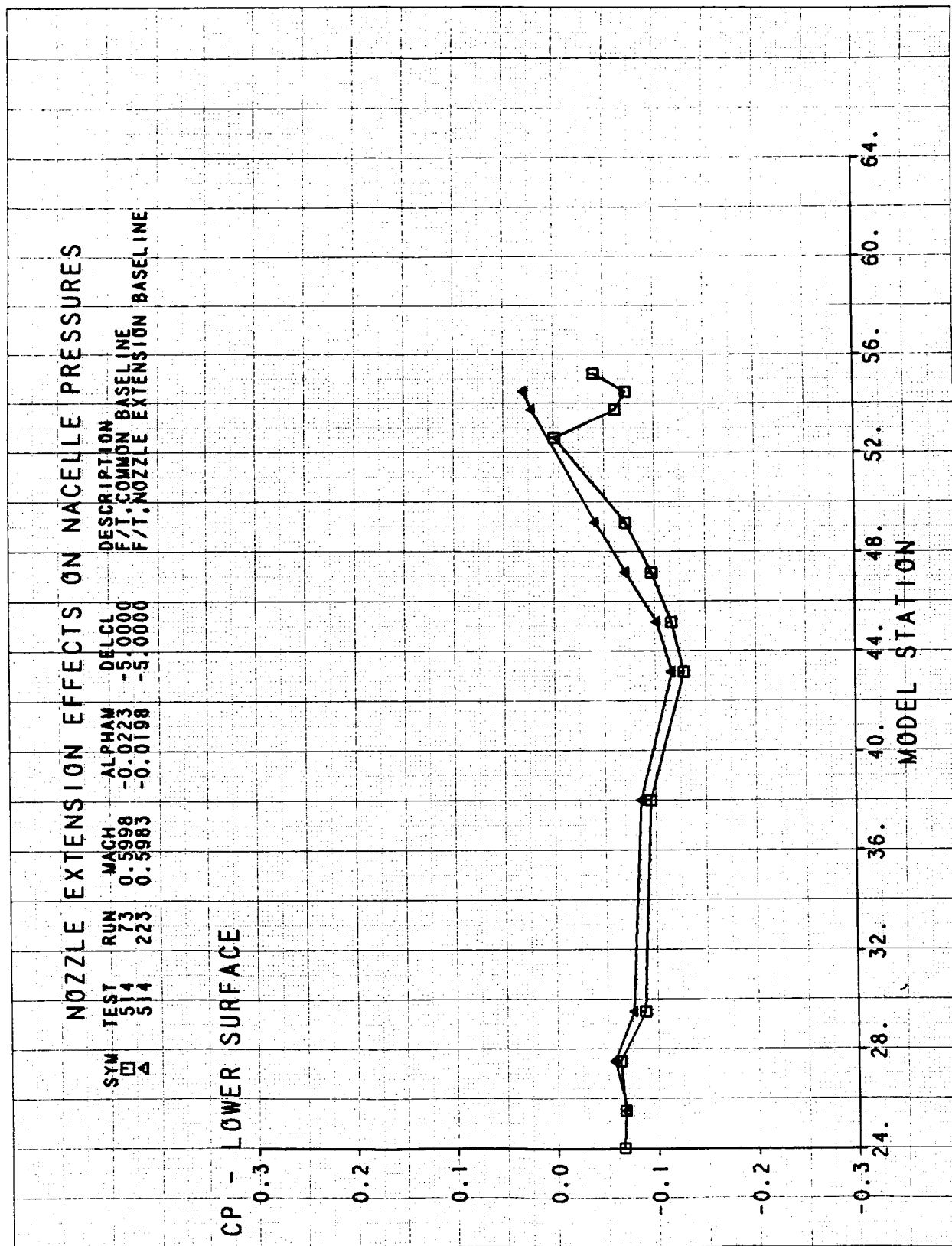




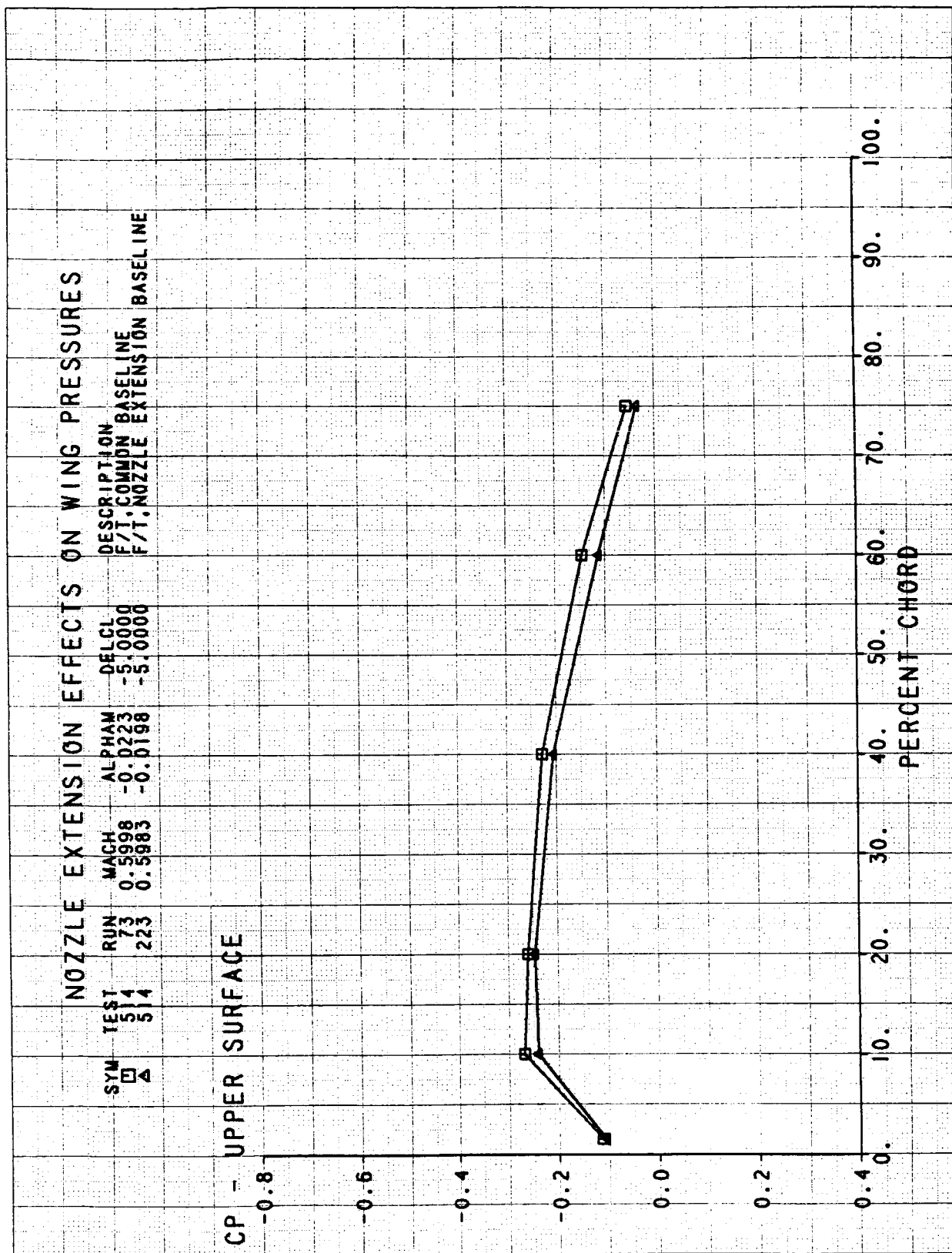




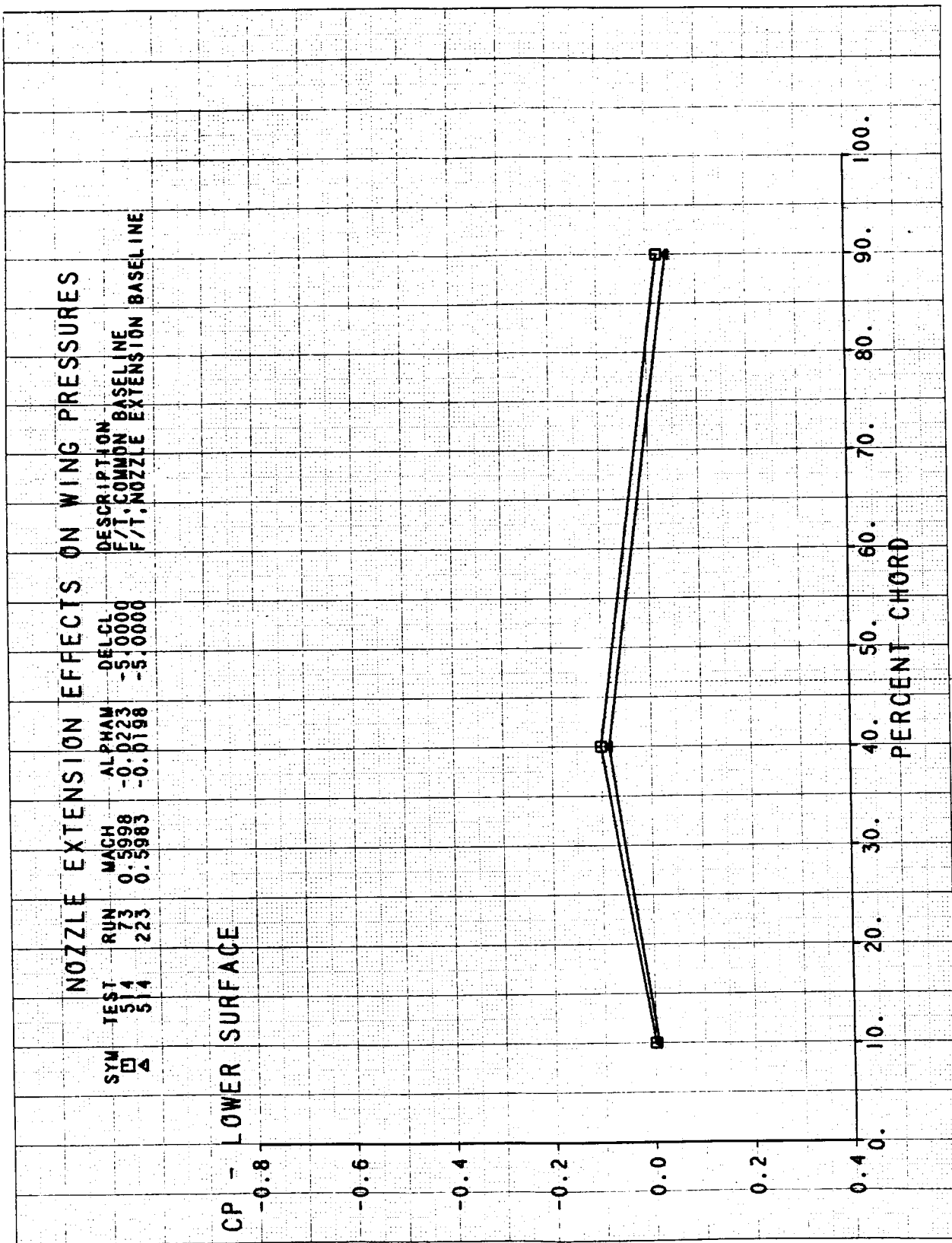


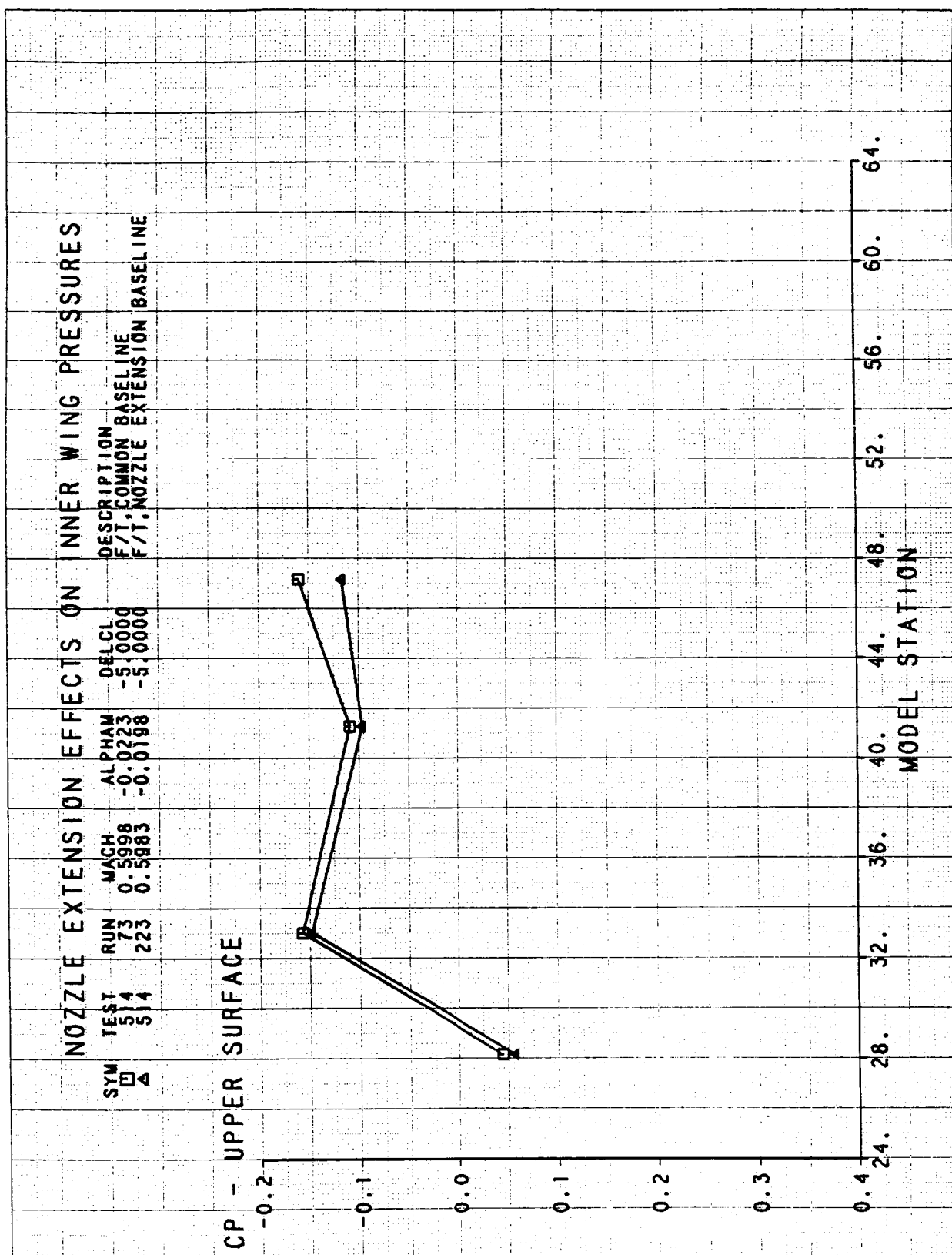


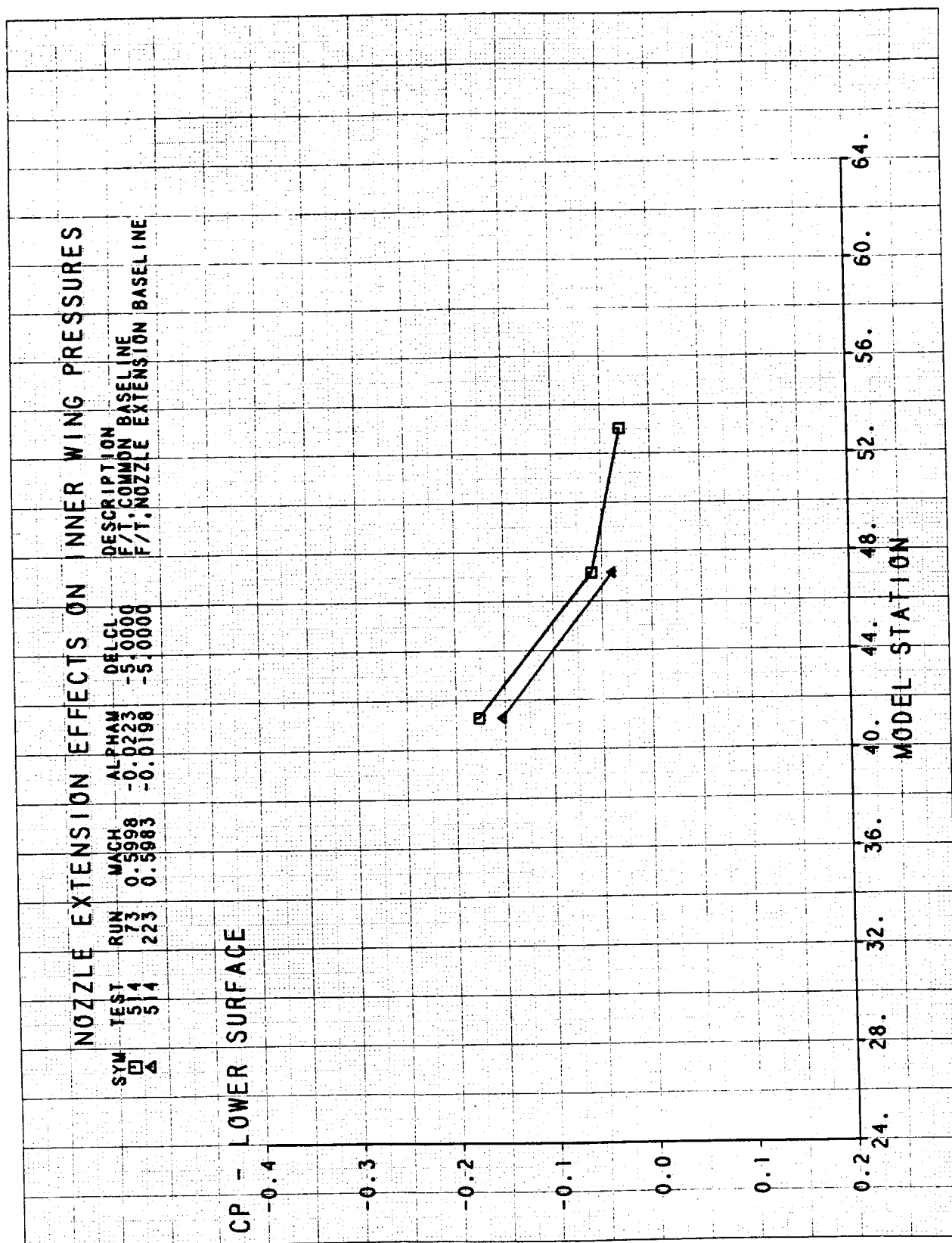


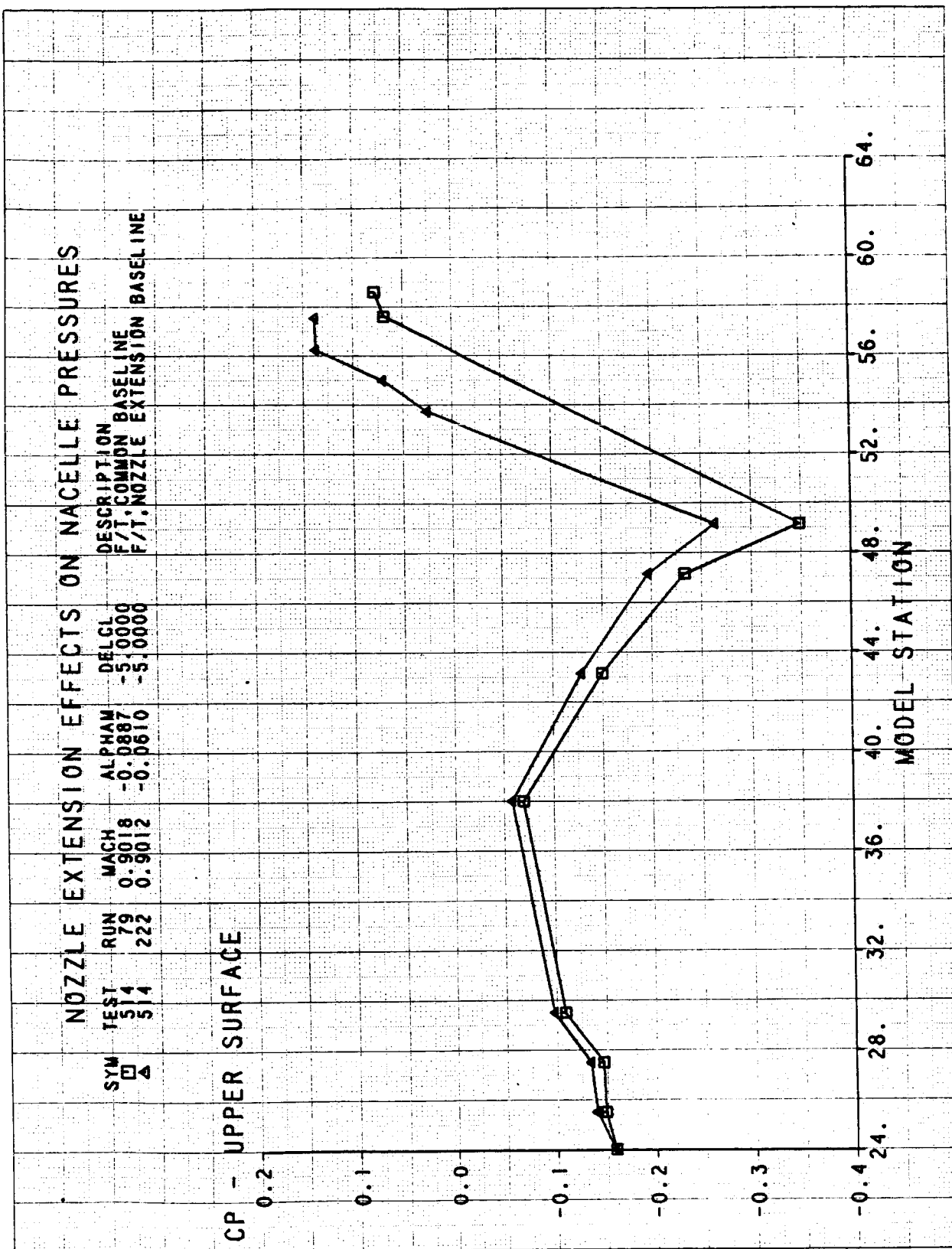


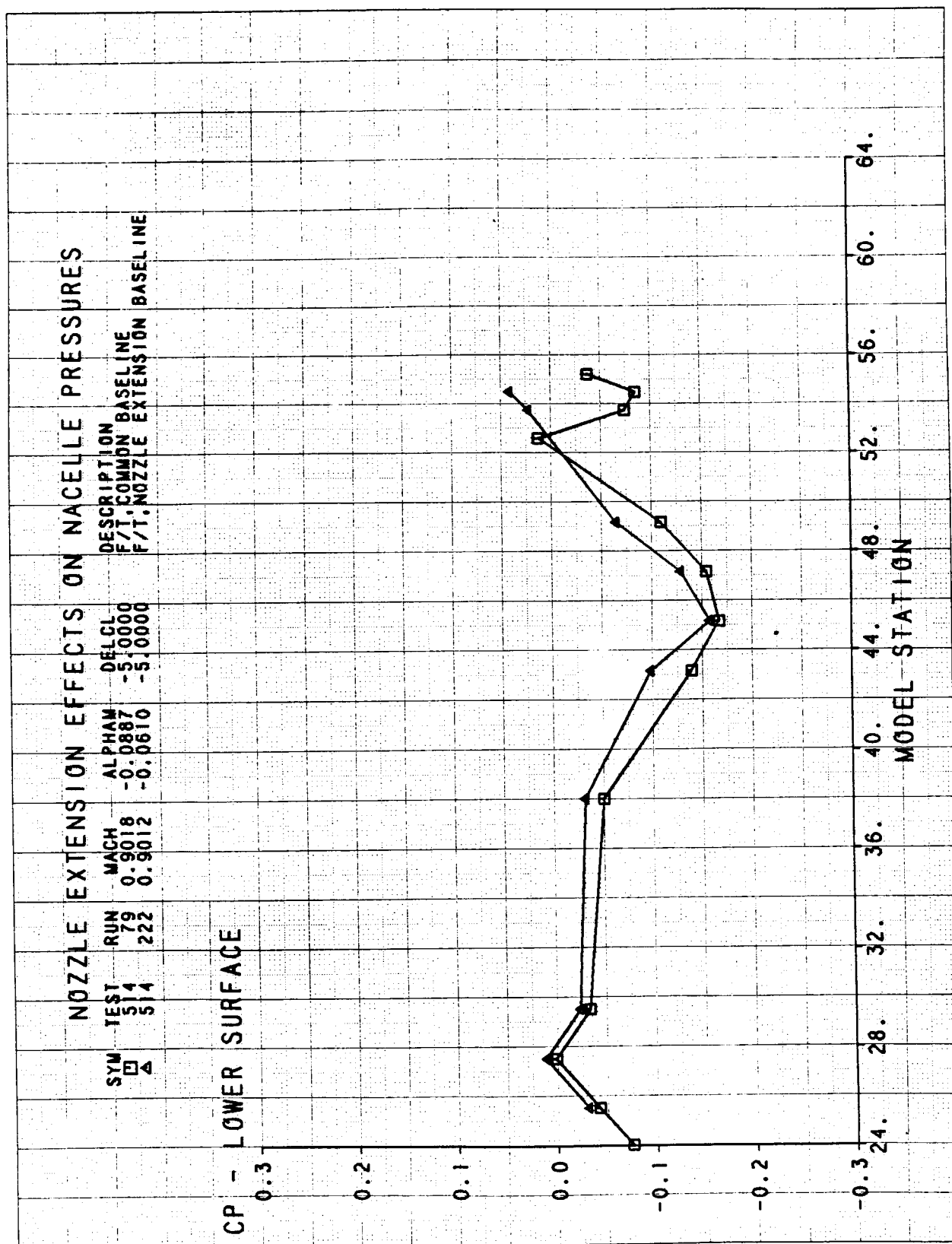


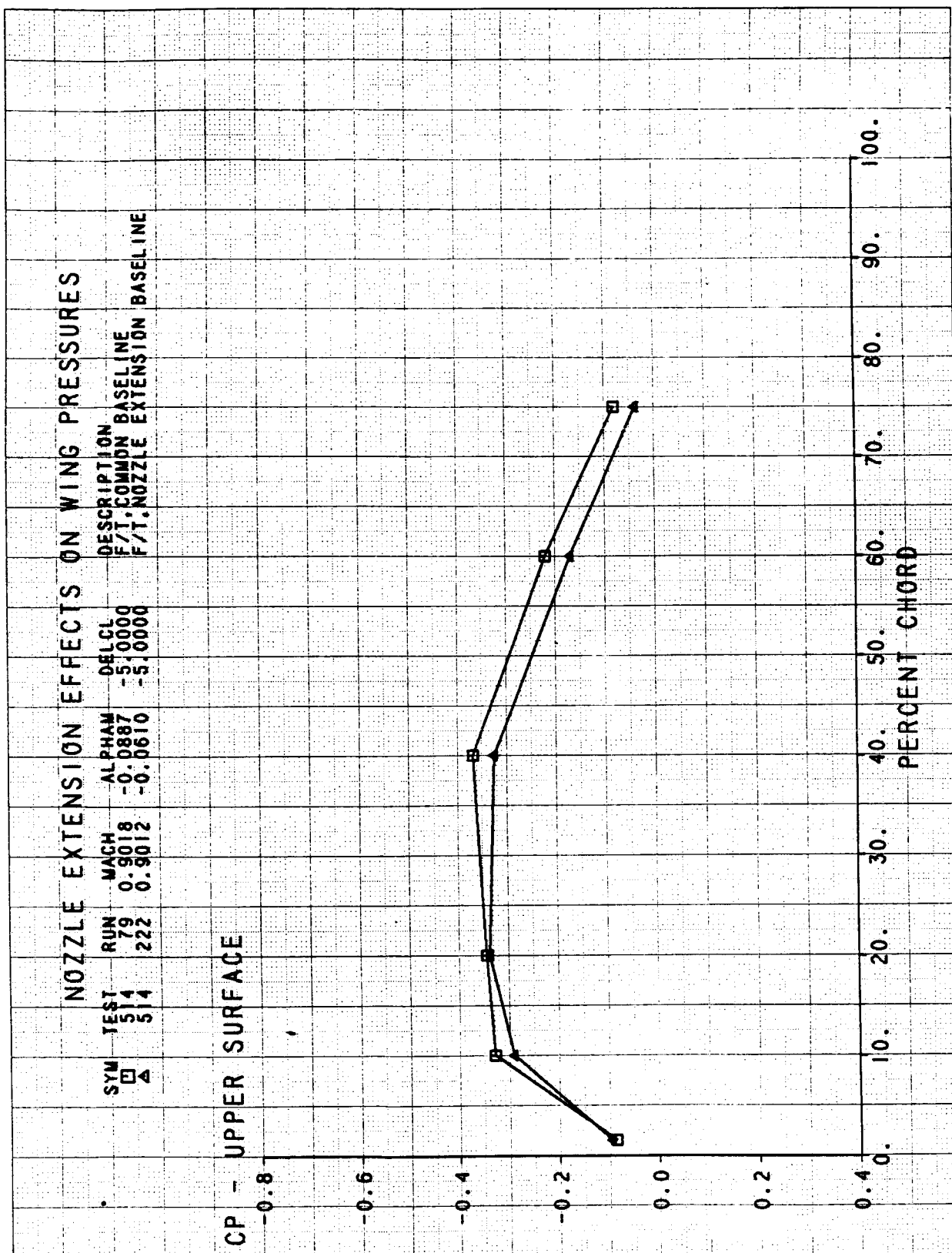


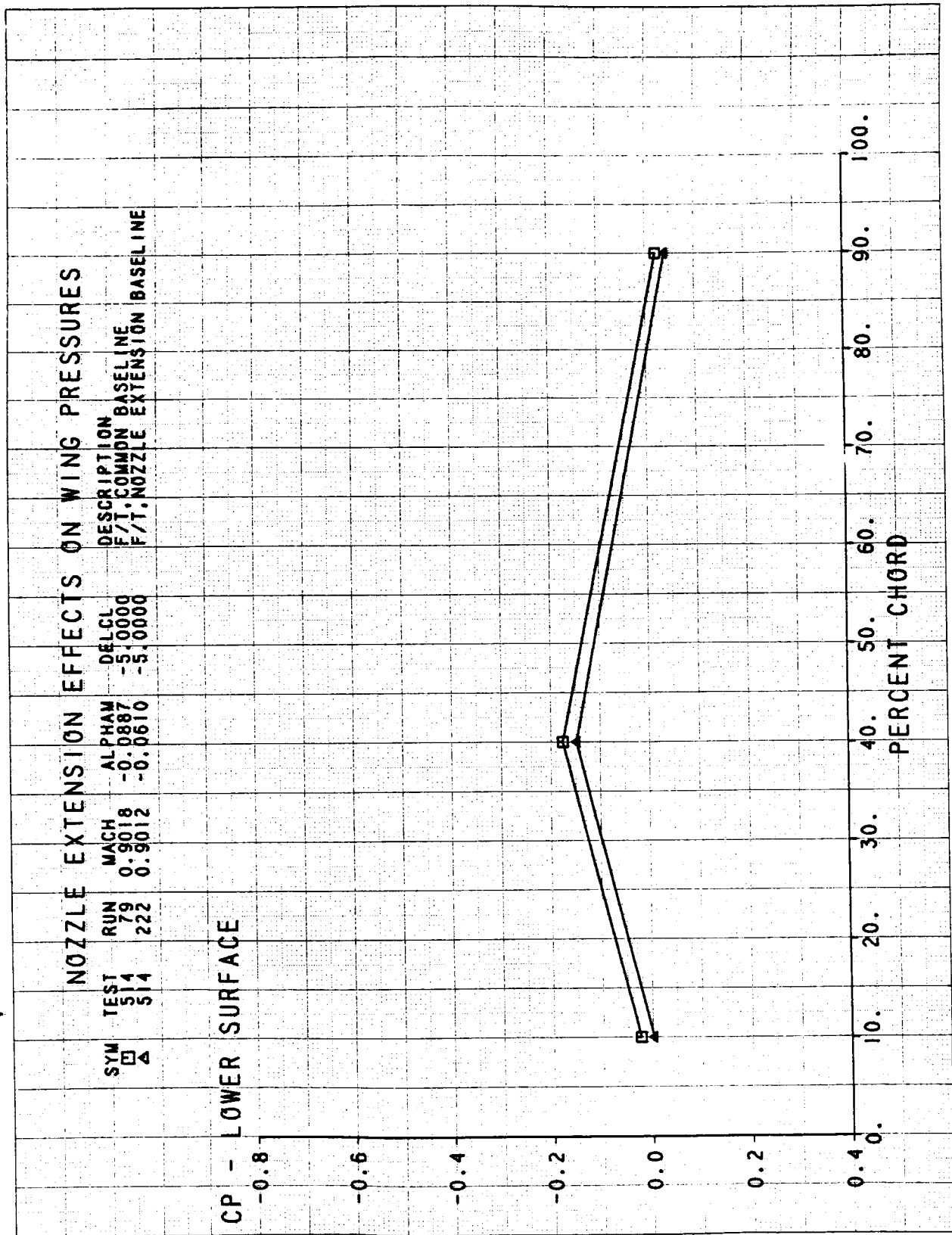


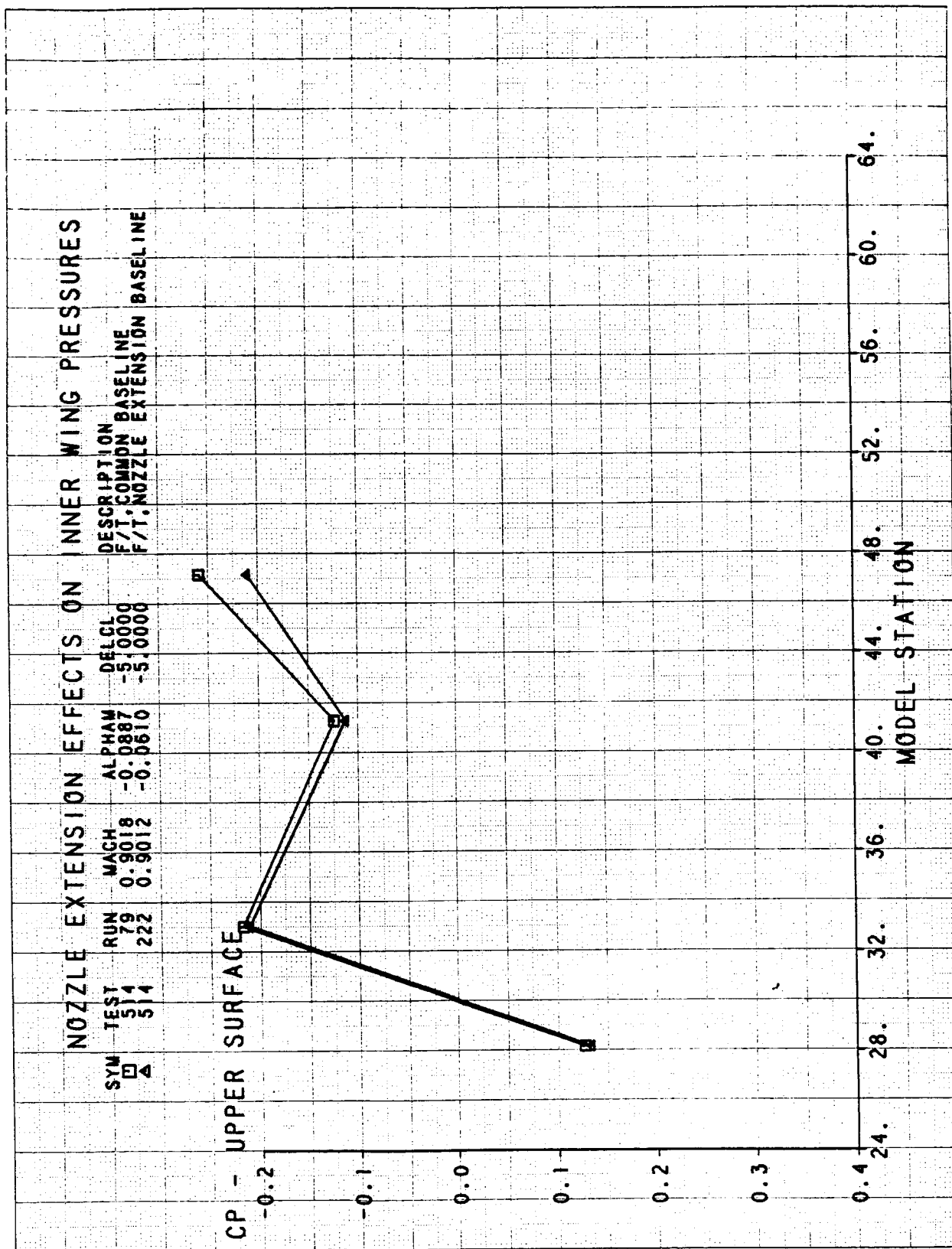




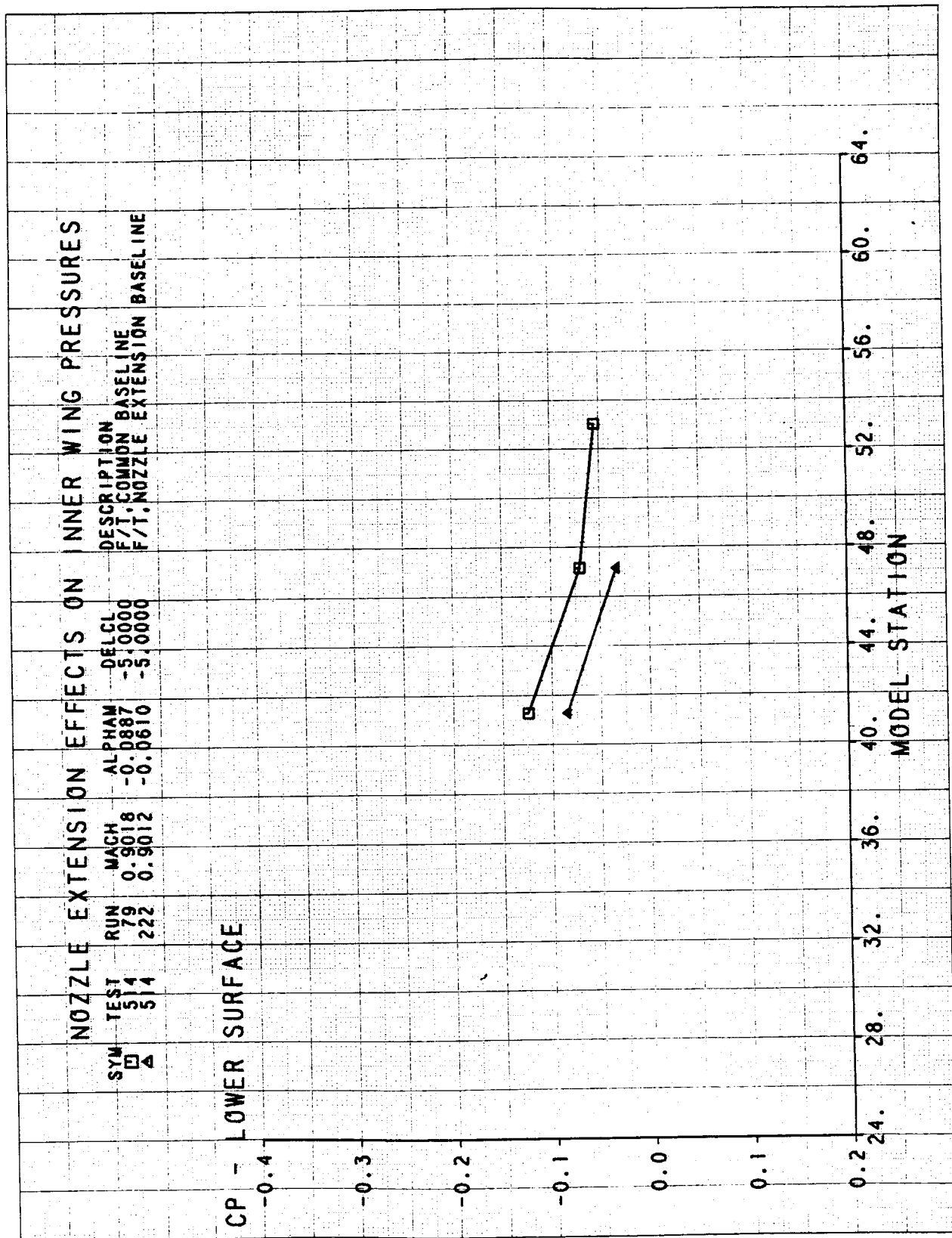


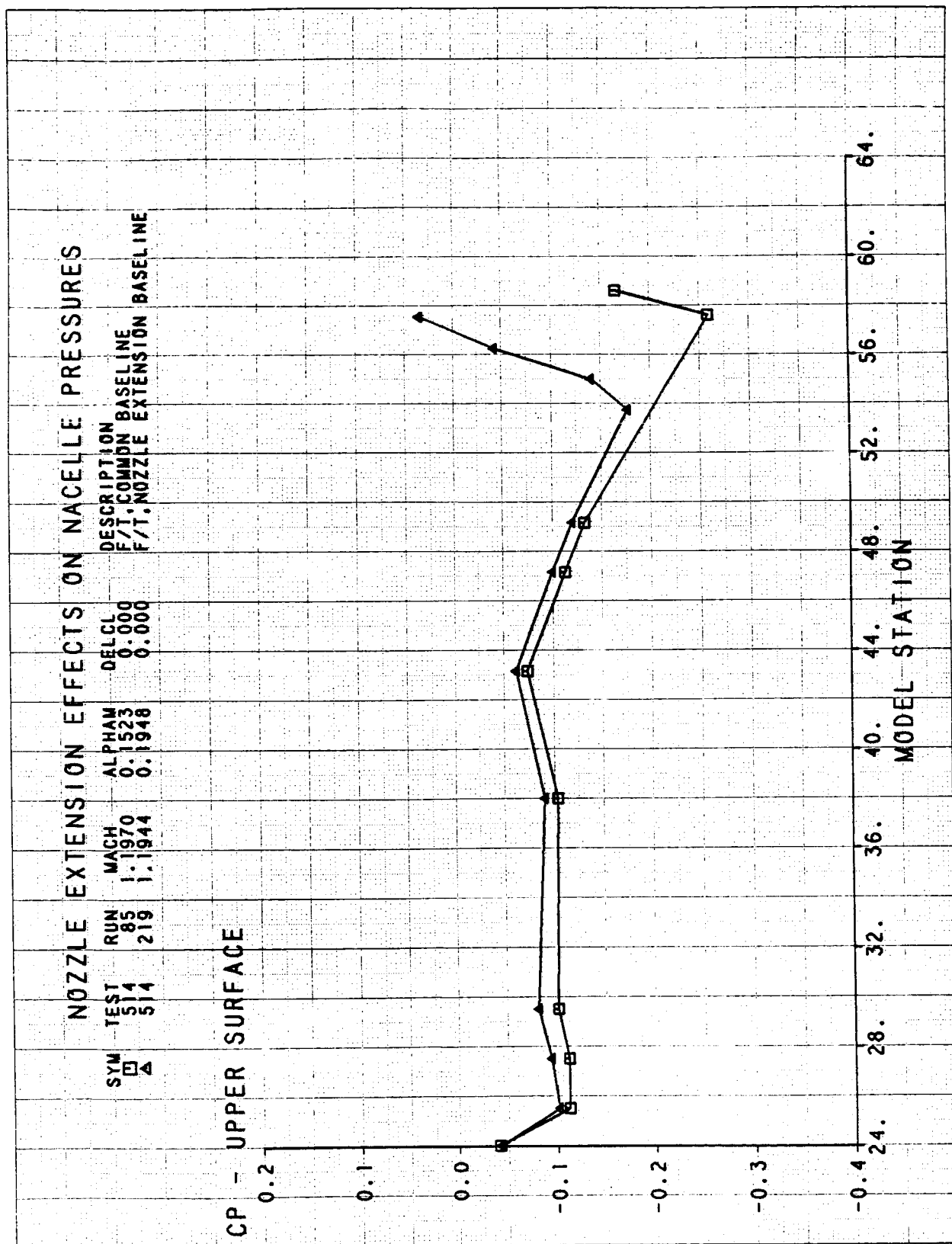


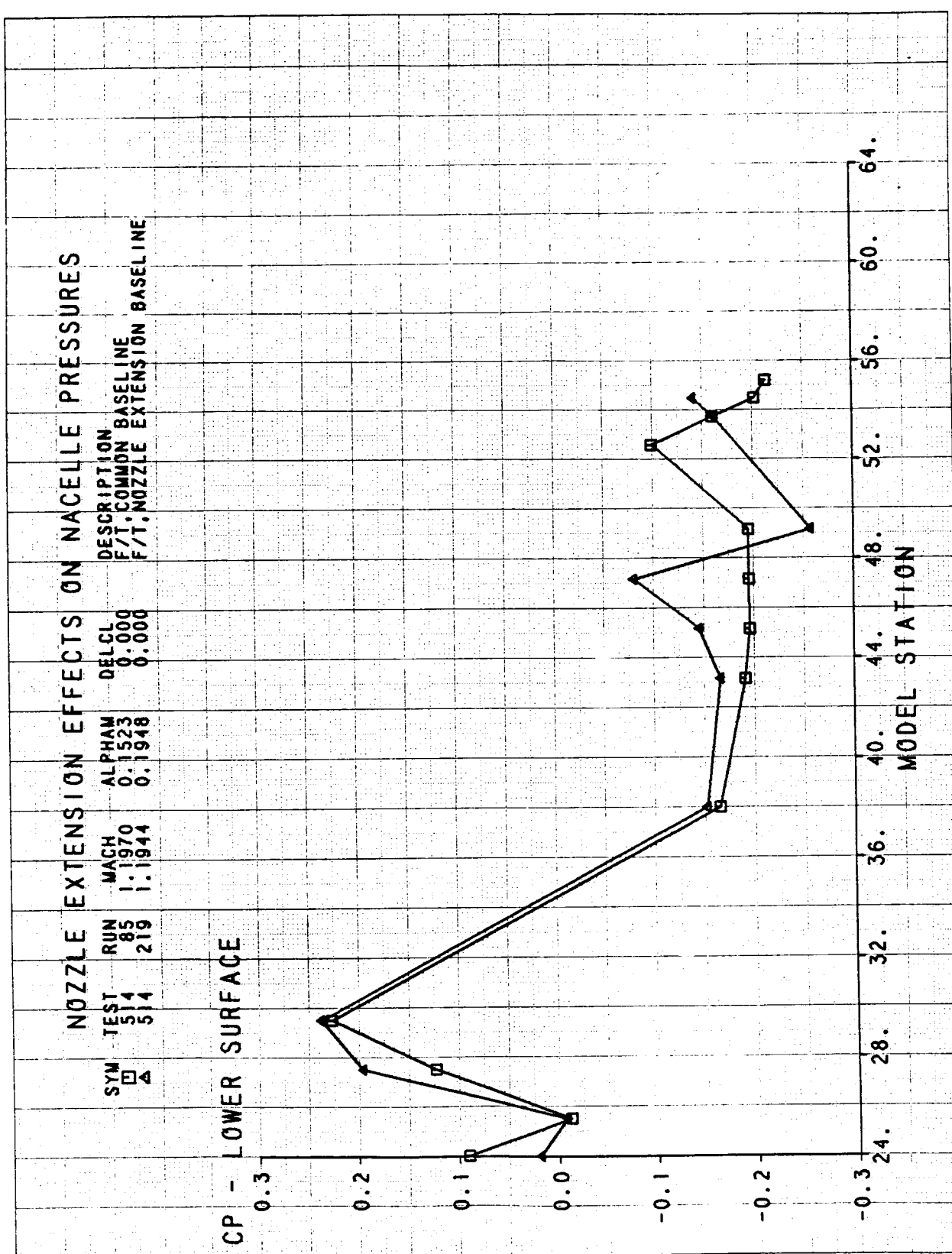


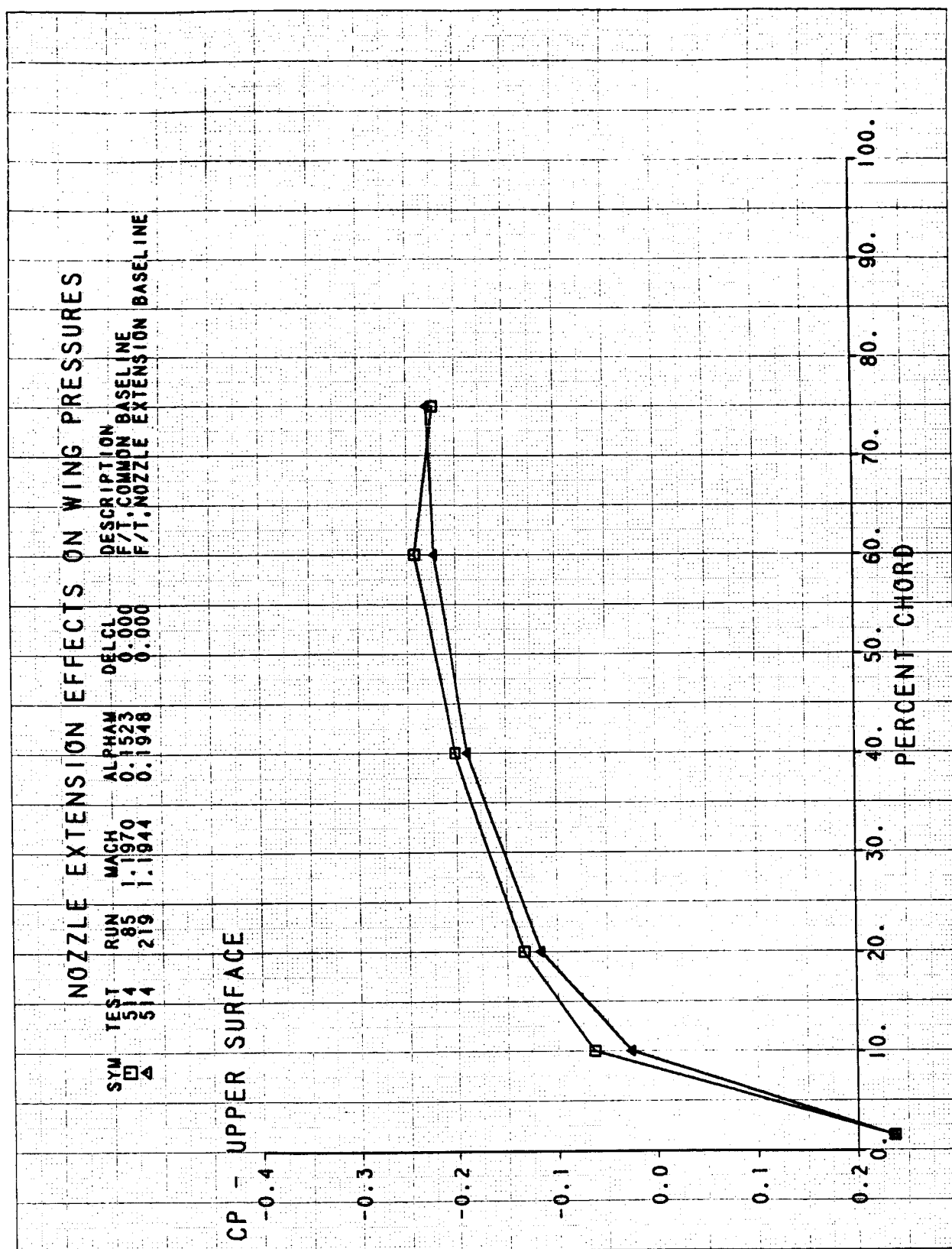


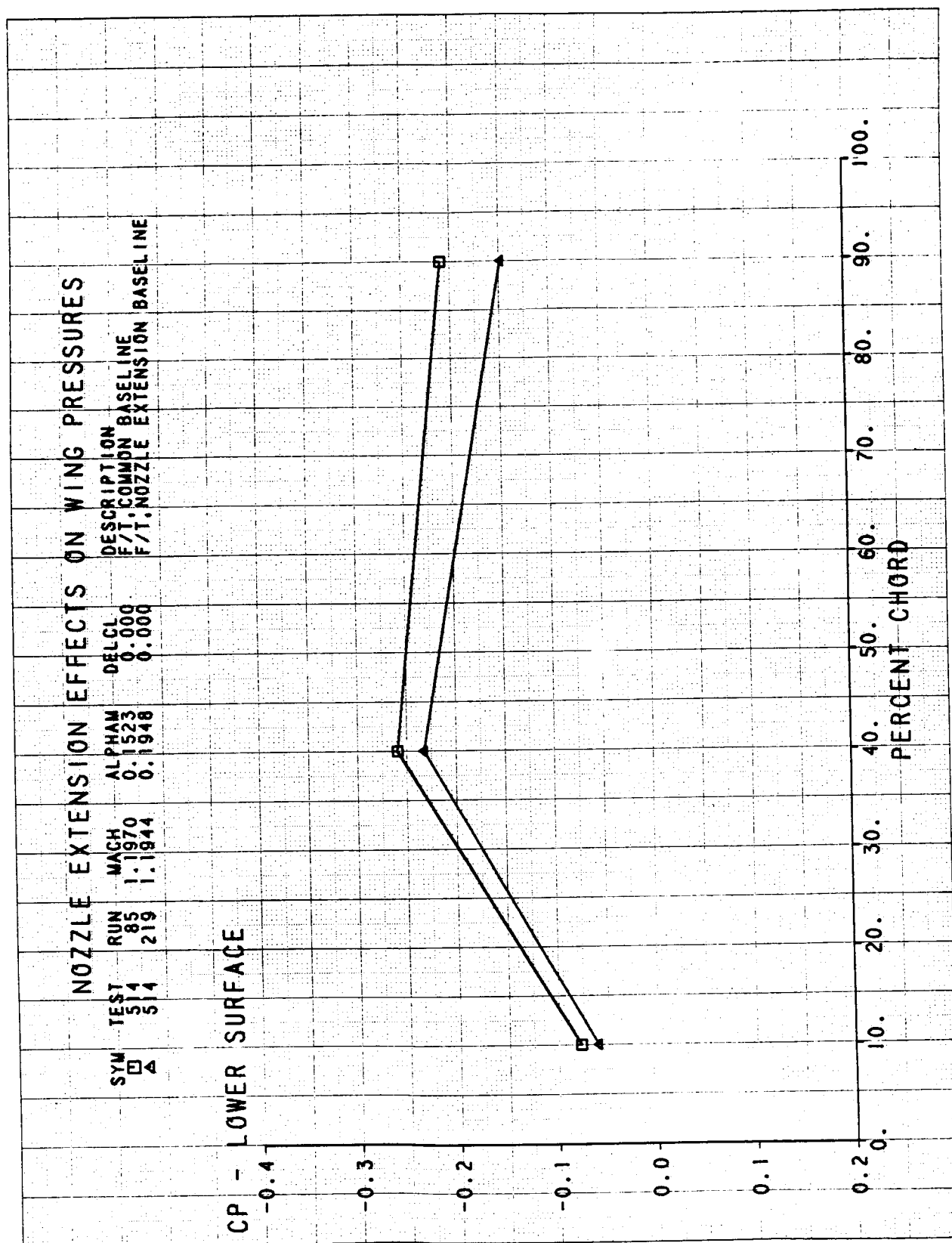


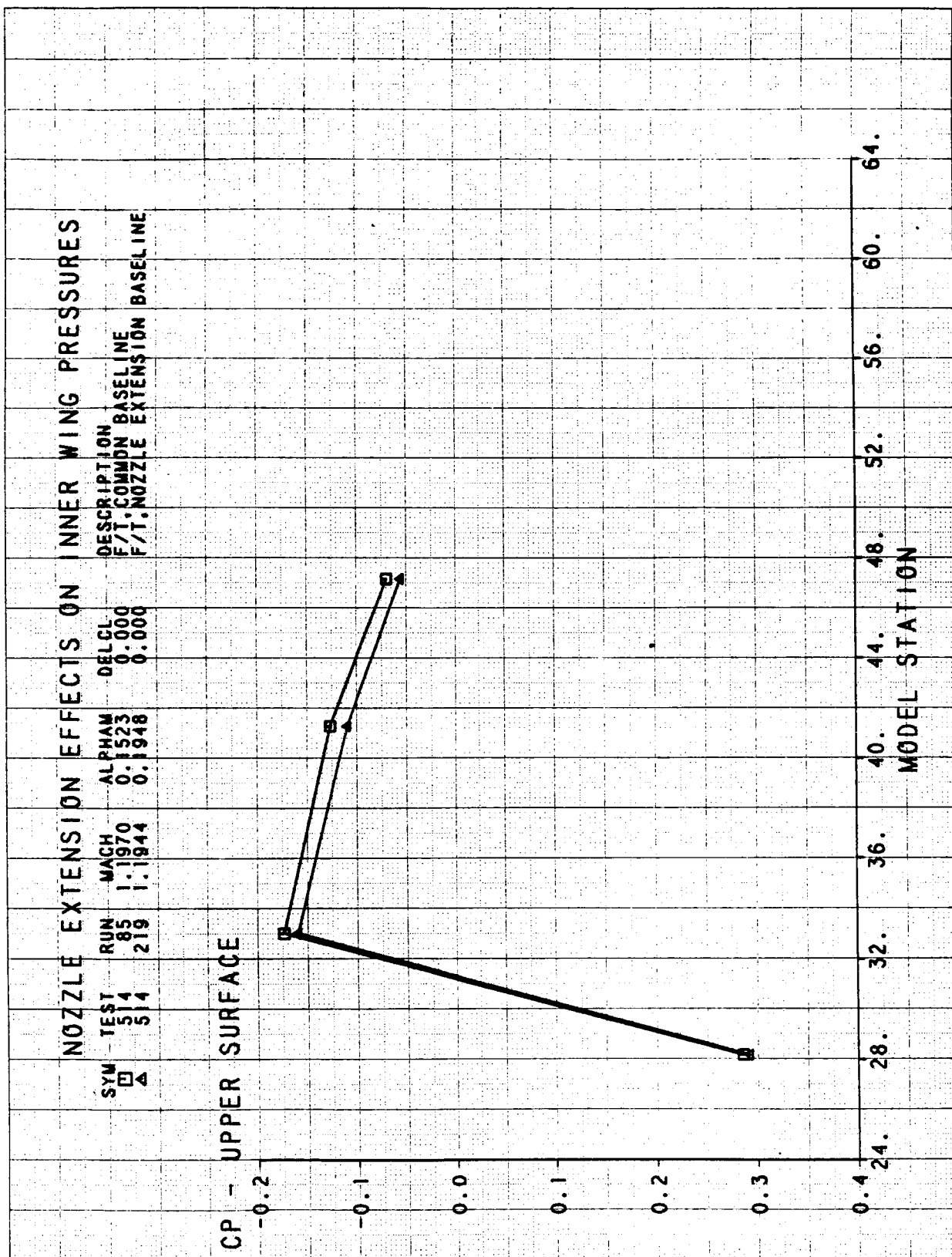


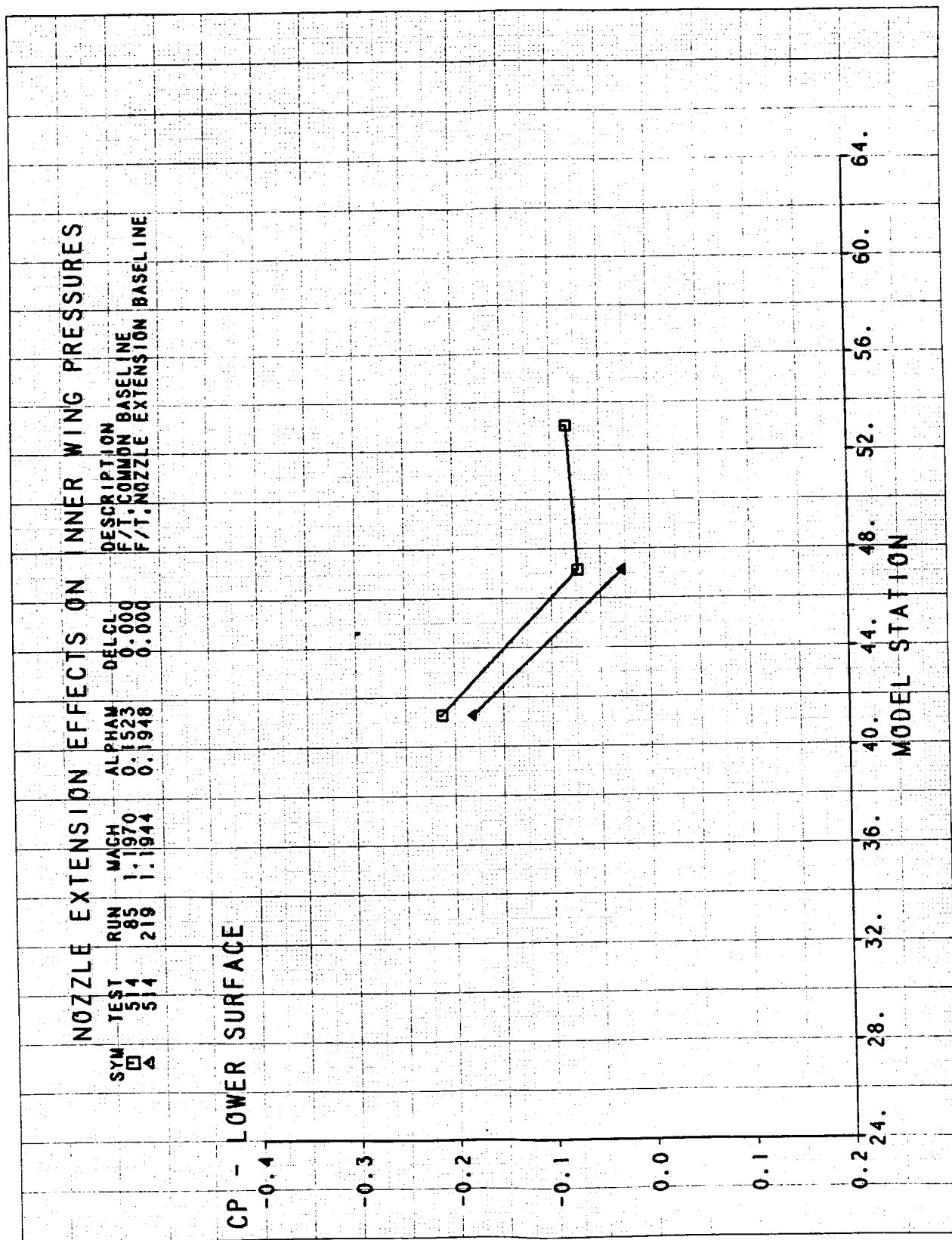


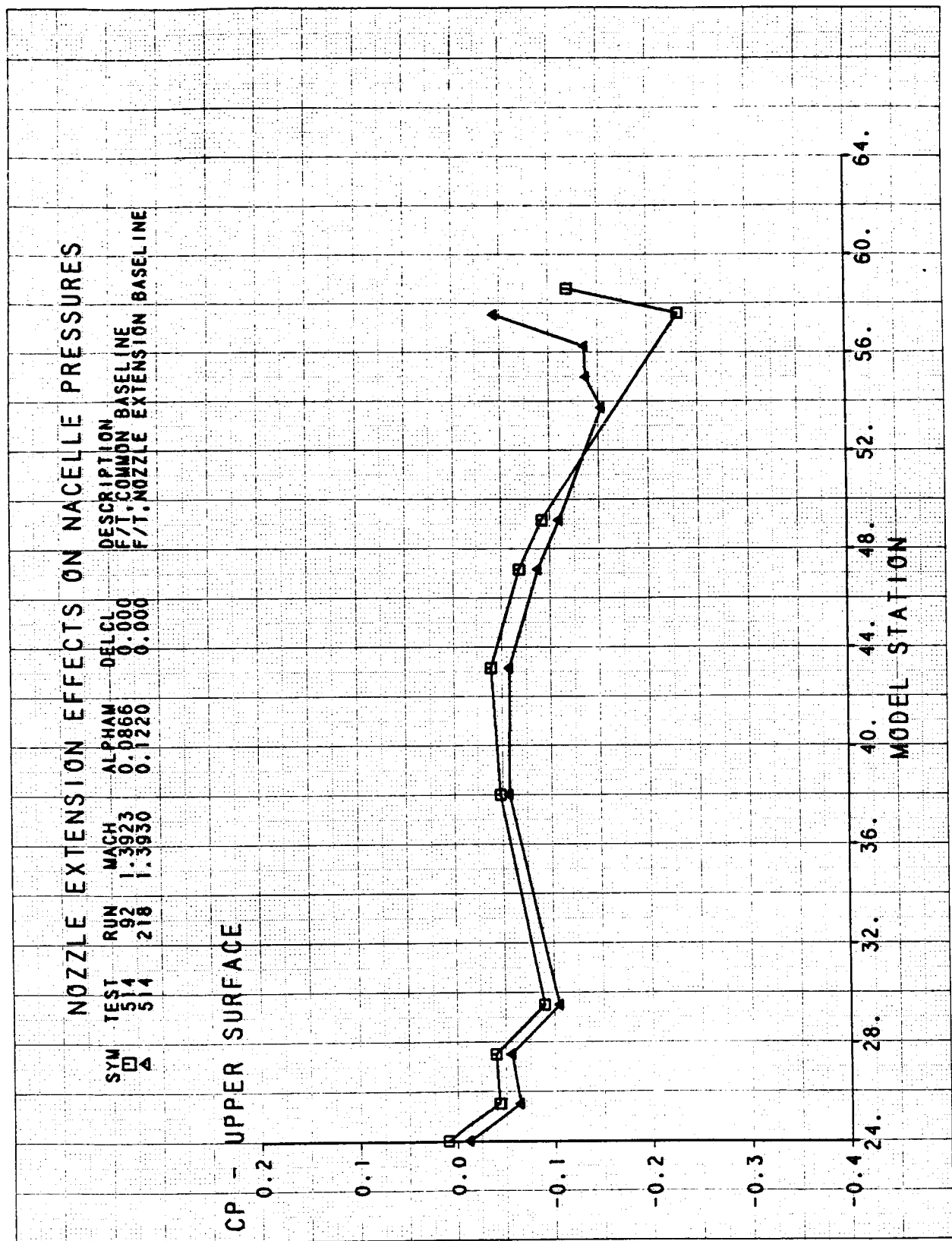




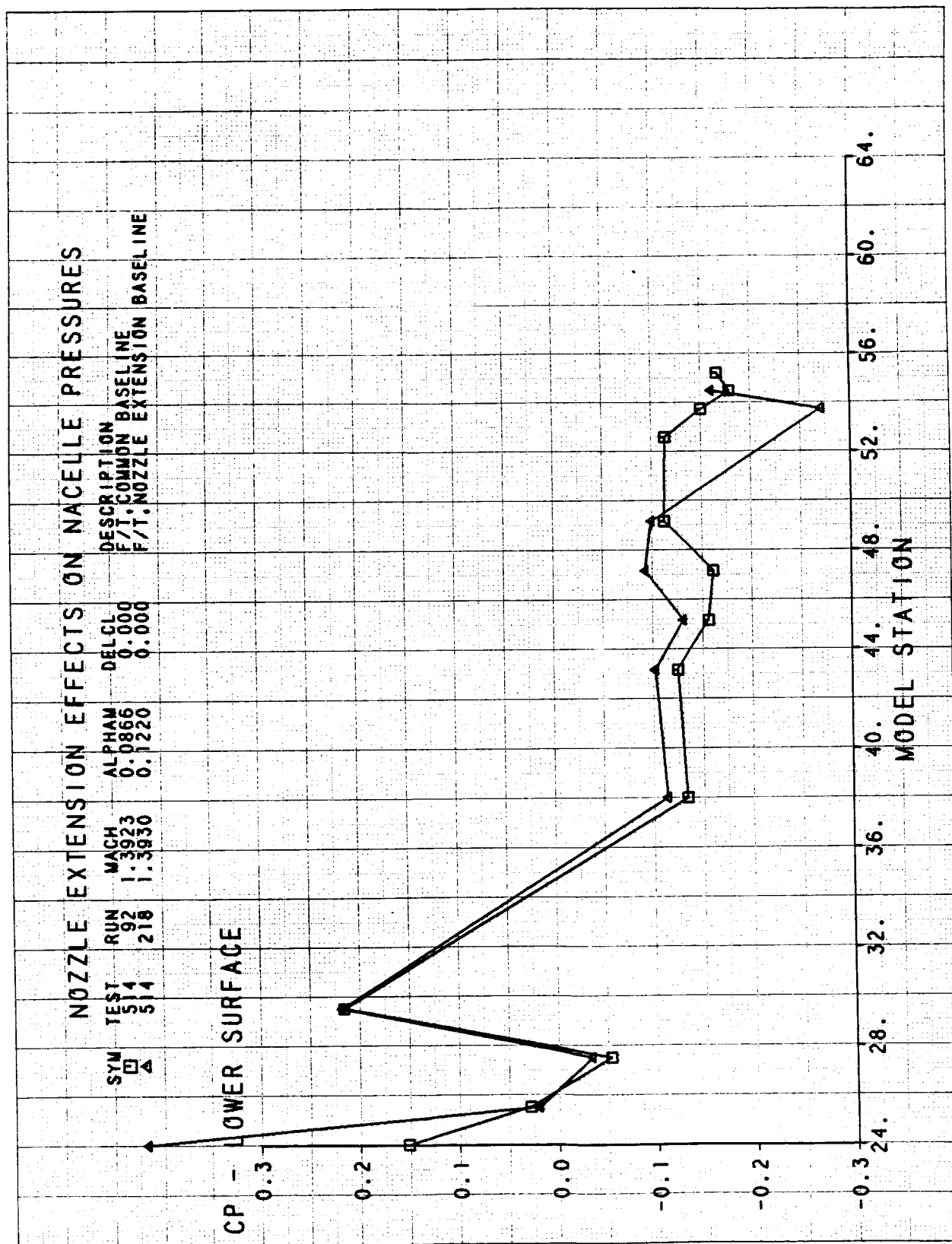


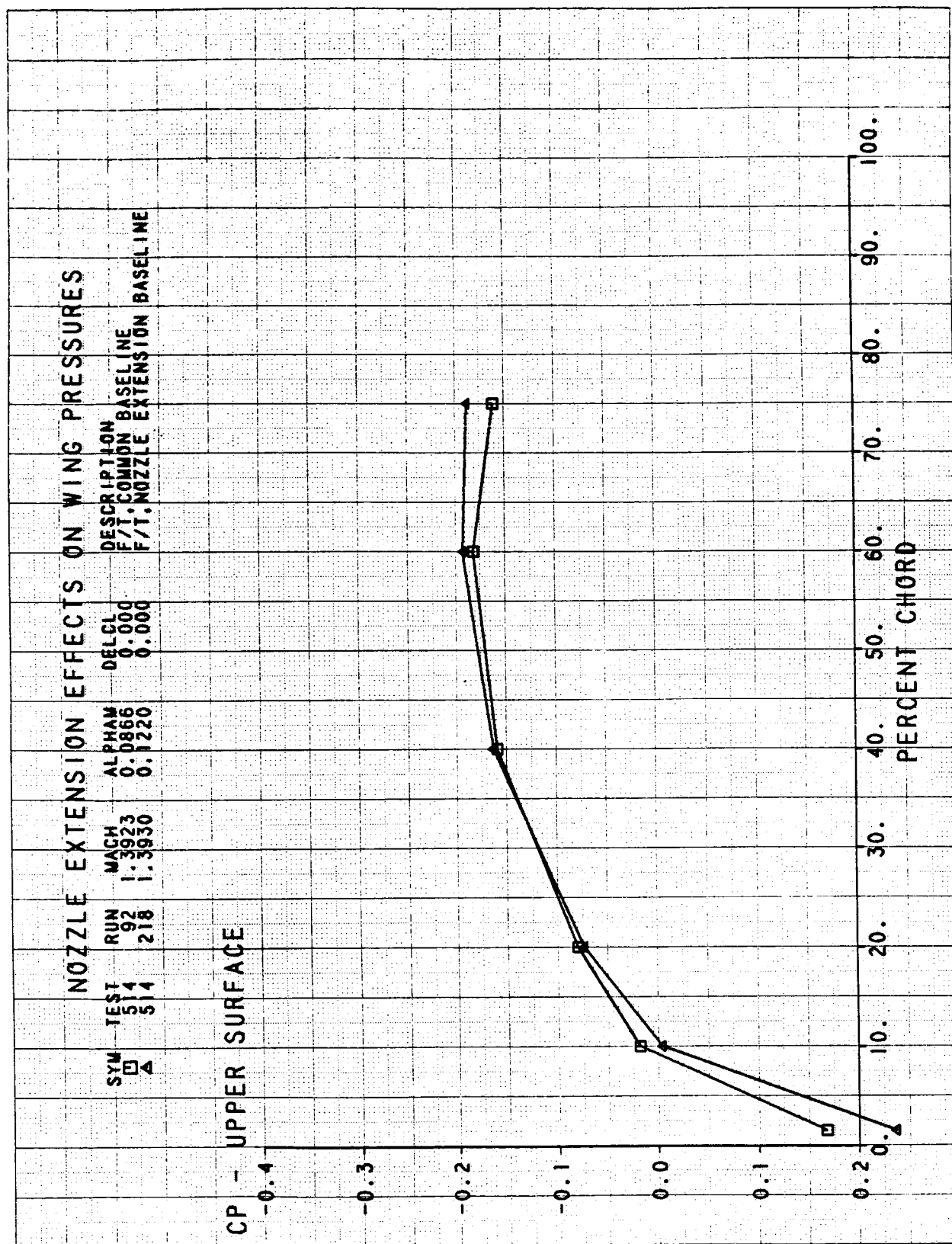


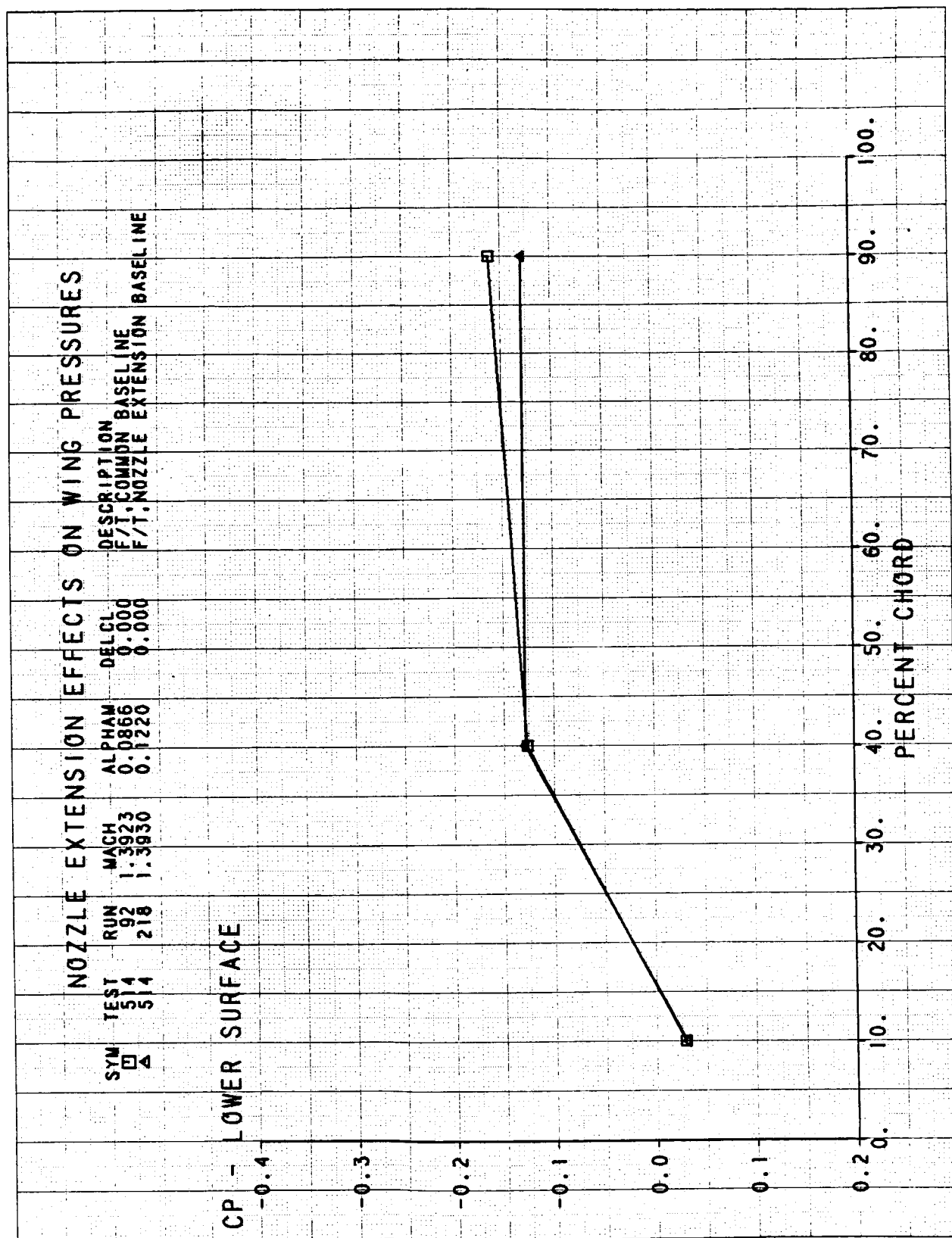


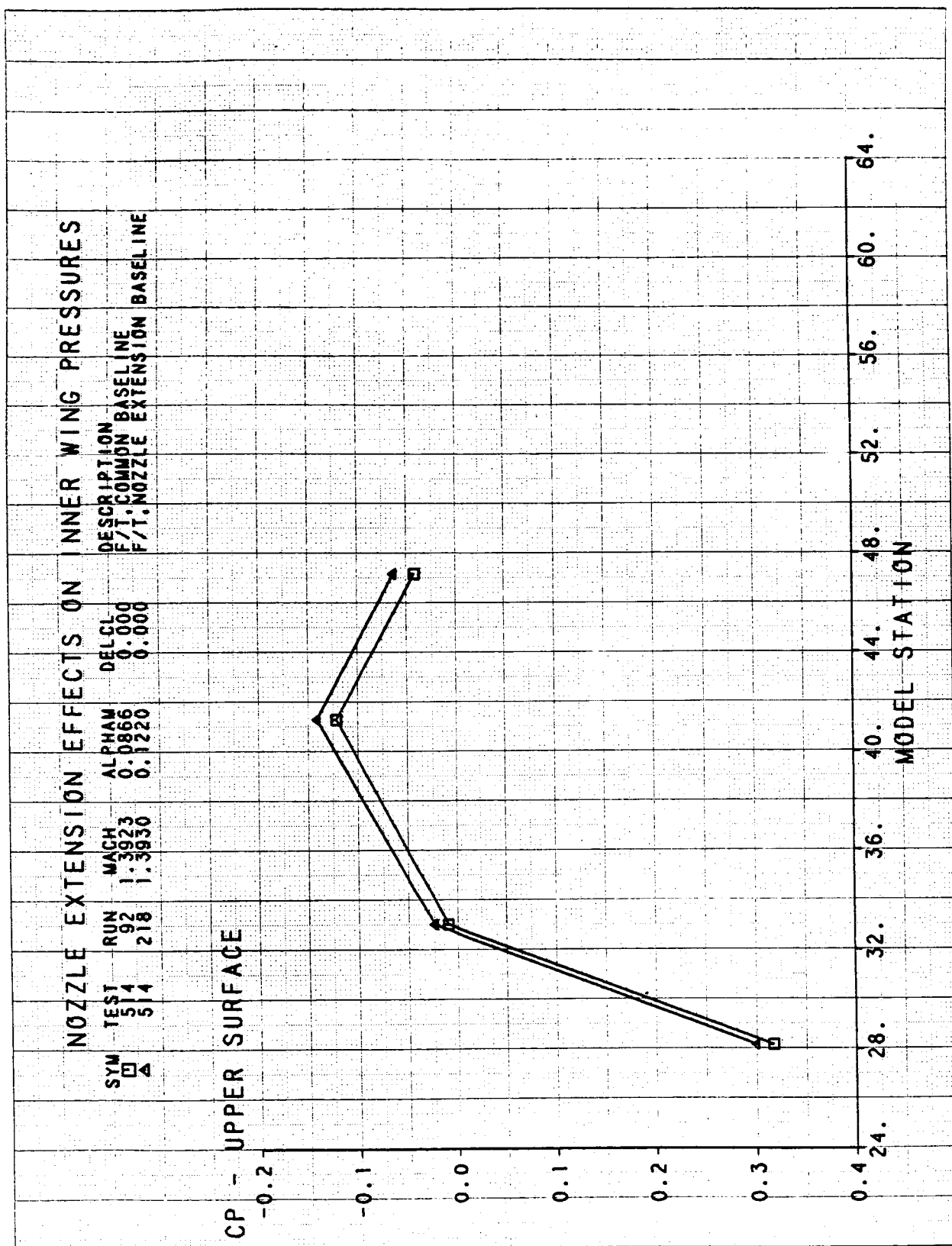


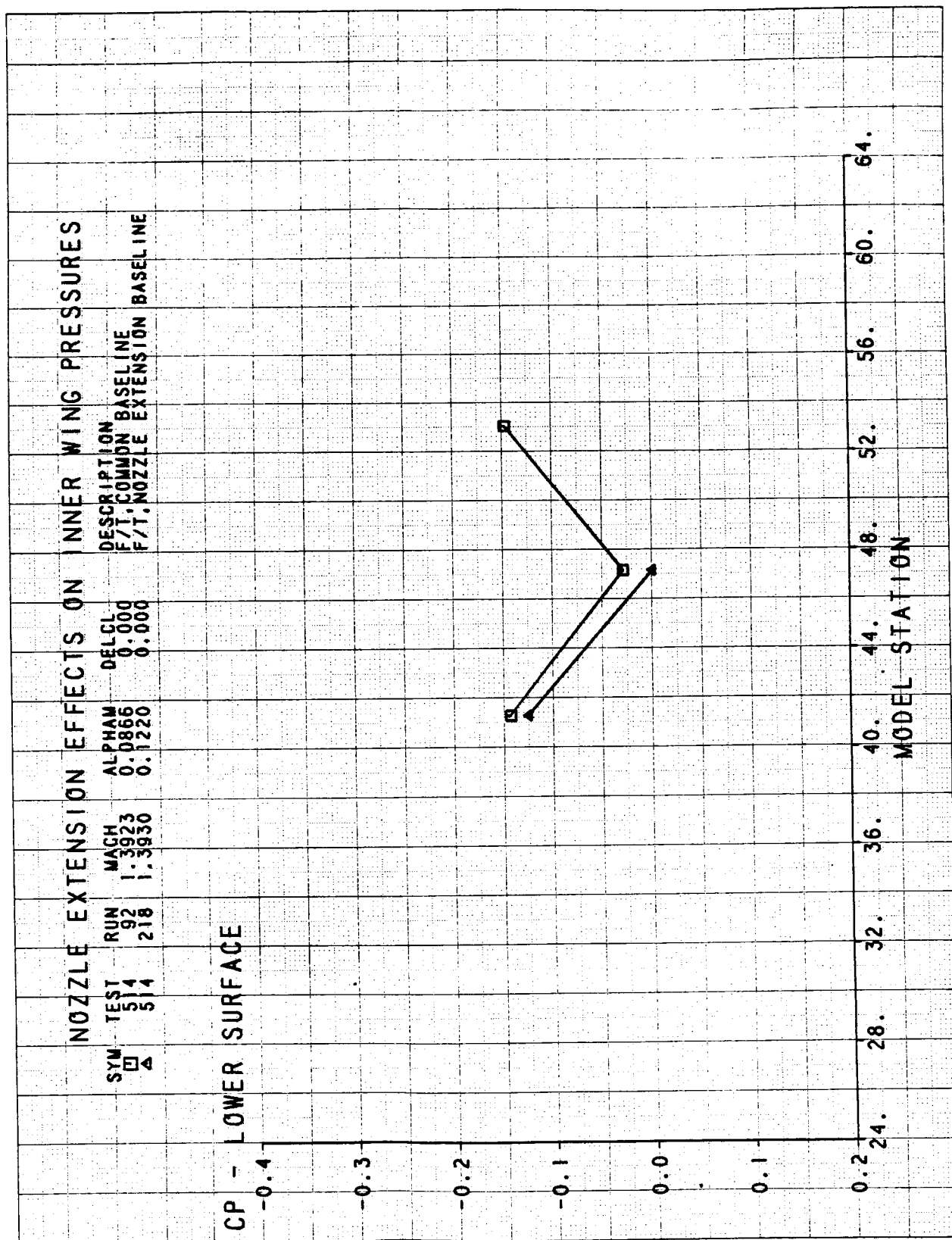






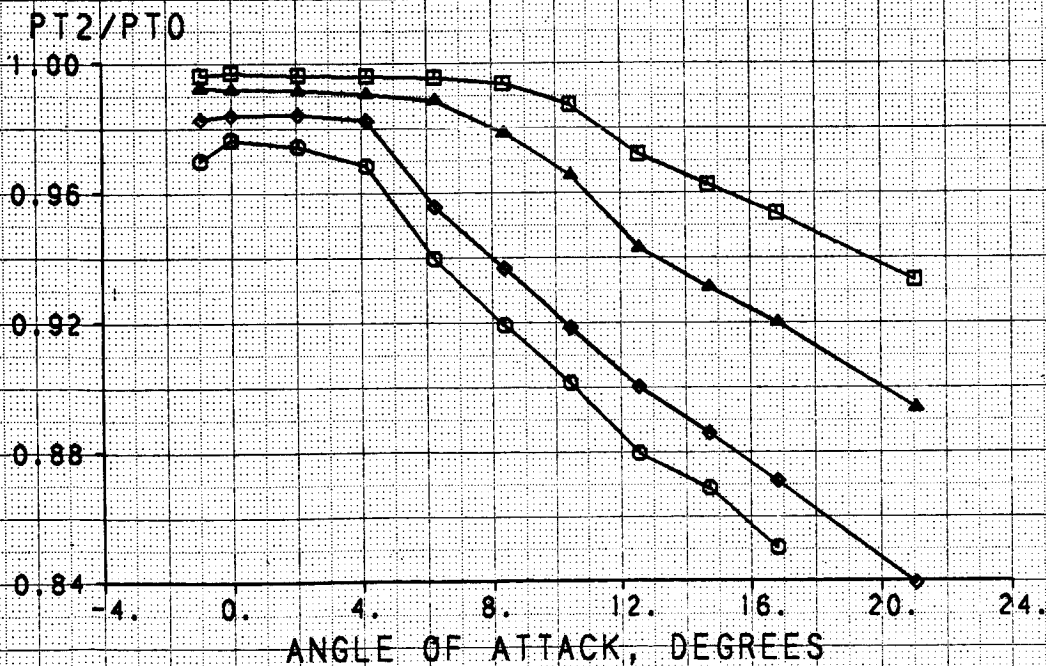
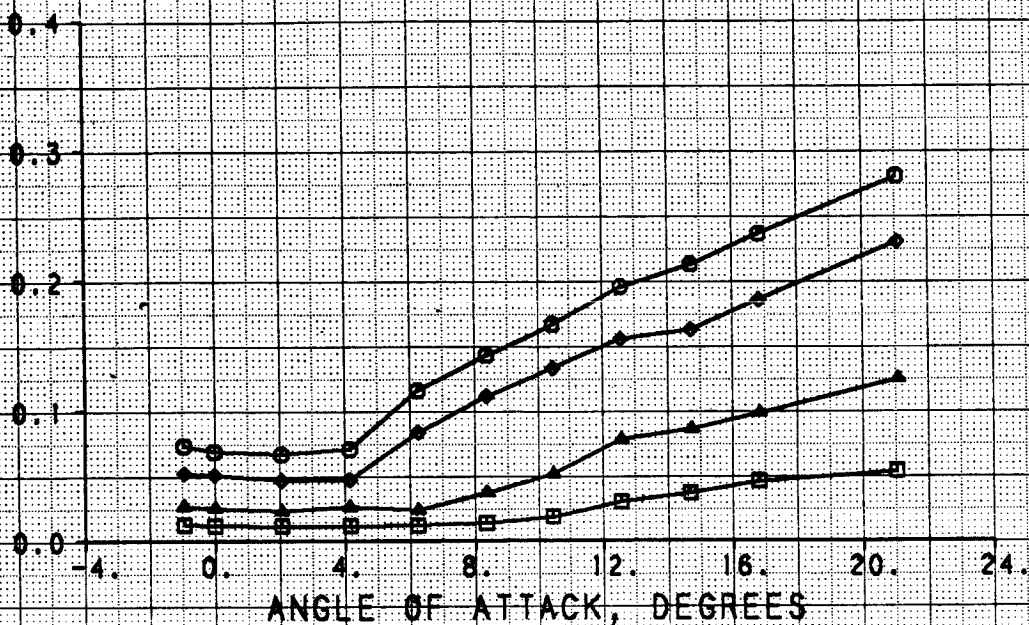






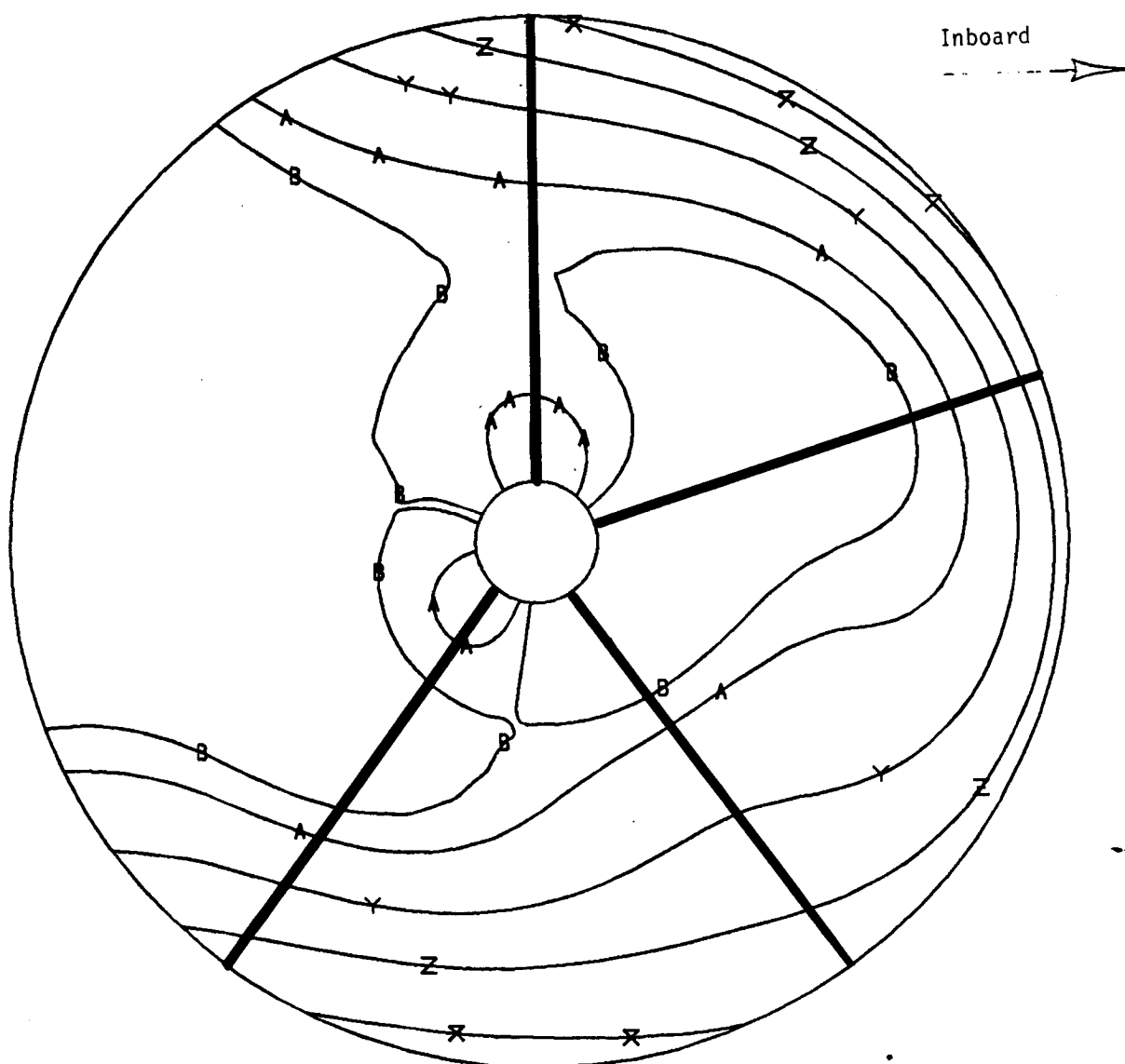
# DISTORTION AND RECOVERY VERSUS ANGLE OF ATTACK RIGHT HAND INLET - FLOW-THROUGH MODE

SYM	TEST	RUN	RMACH	RMFRA	RDELCH
□	514	188	0.3988	0.5546	-4.9989
▲	514	206	0.3982	0.8216	-5.0253
○	514	178	0.3979	1.1164	-4.9648
○	514	167	0.4442	1.1343	-4.9573



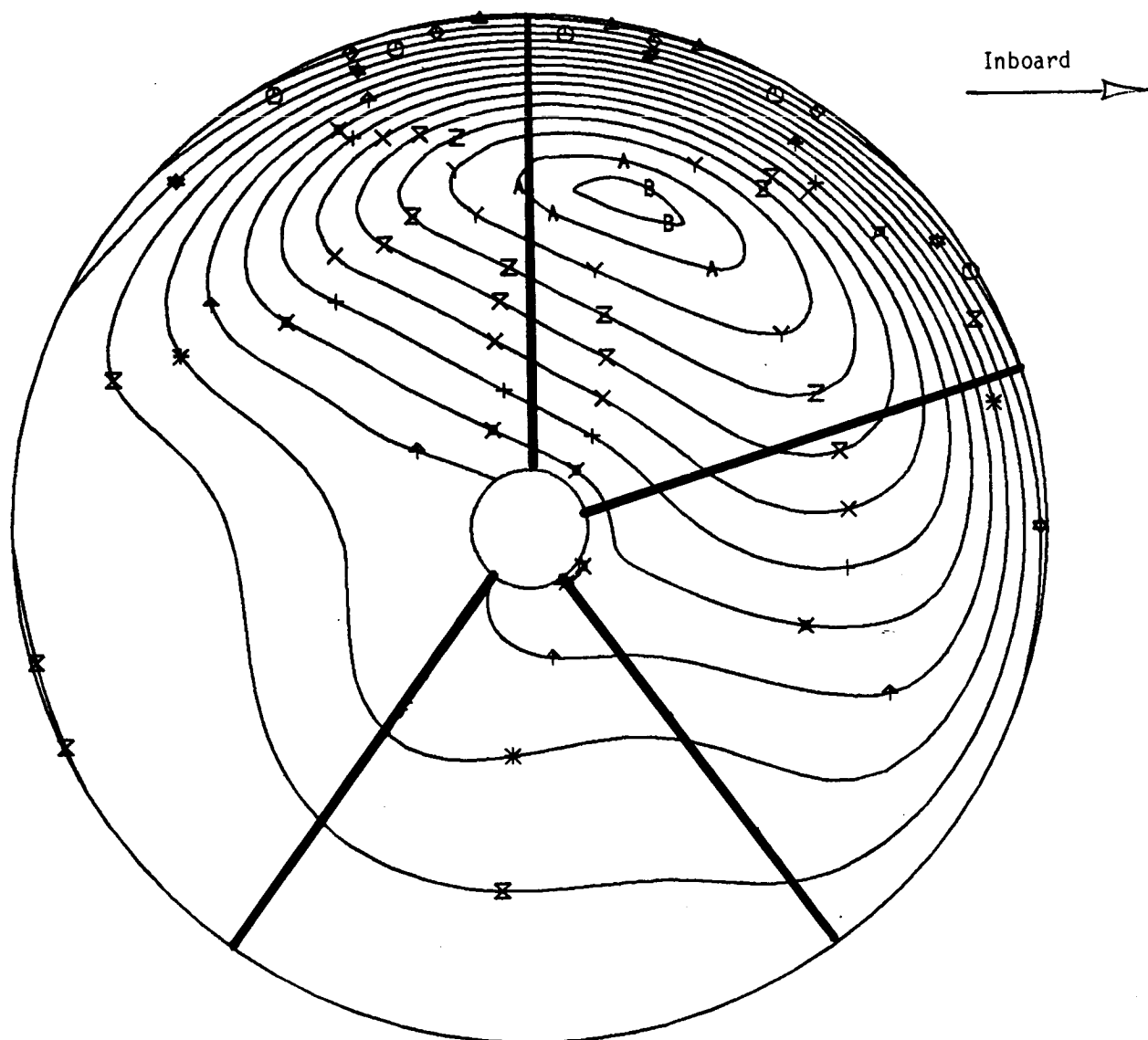
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	167	0.4442	.00347	1.2147	-4.9573	0.9715	0.0713
—□—	0.70000	—▲—	0.72000	—◆—	0.74000		
—○—	0.76000	—●—	0.78000	—⊗—	0.80000		
—*—	0.82000	—↑—	0.84000	—×—	0.86000		
—+—	0.88000	—×—	0.90000	—⊗—	0.92000		
—z—	0.94000	—y—	0.96000	—*—	0.98000		
—B—	0.99000						



# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

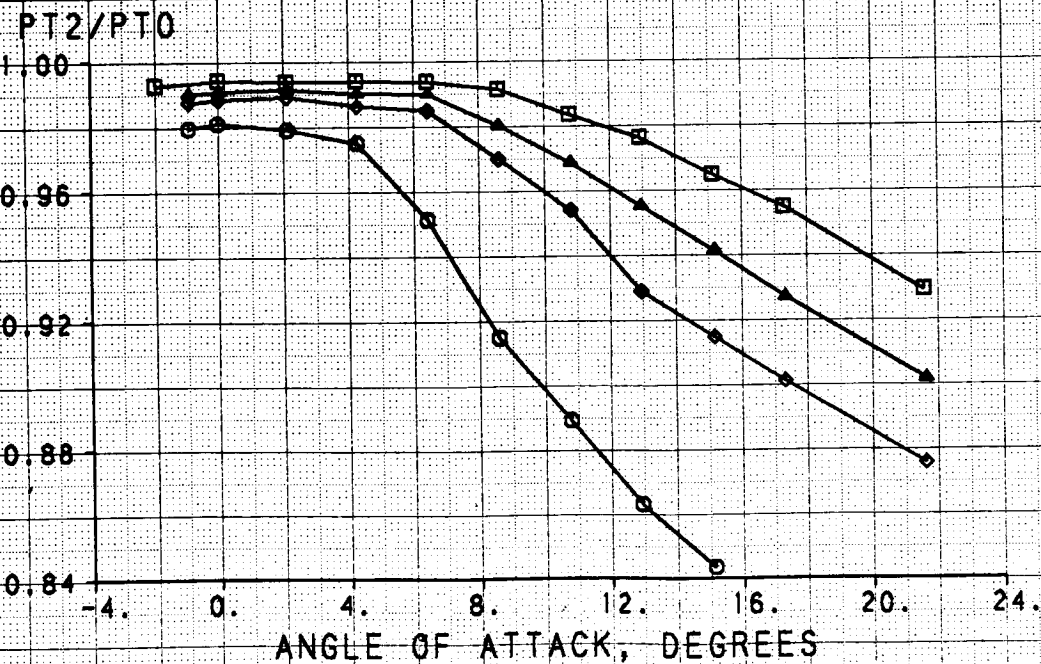
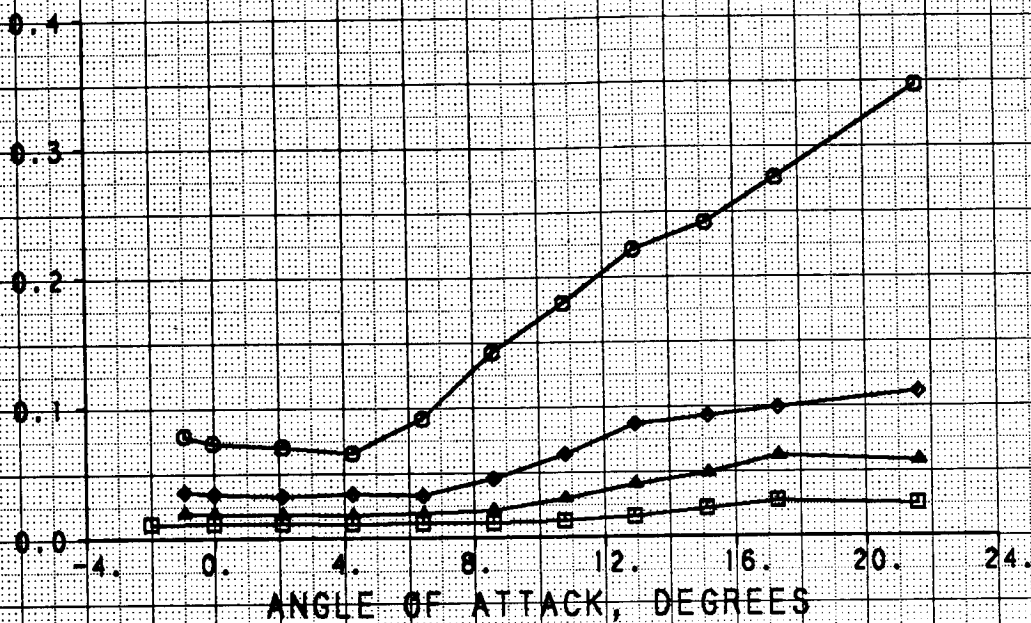
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	REC1R	DF1R
514	167	0.4442	16.823	1.0536	-4.9573	0.8504	0.2367
—□—	0.70000	—▲—	0.72000	—◆—		0.74000	
—○—	0.76000	—●—	0.78000		—⊠—	0.80000	
—*—	0.82000	—+—	0.84000		—x—	0.86000	
—+—	0.88000		0.90000		—x—	0.92000	
—z—	0.94000		0.96000		—x—	0.98000	
—b—	0.99000						





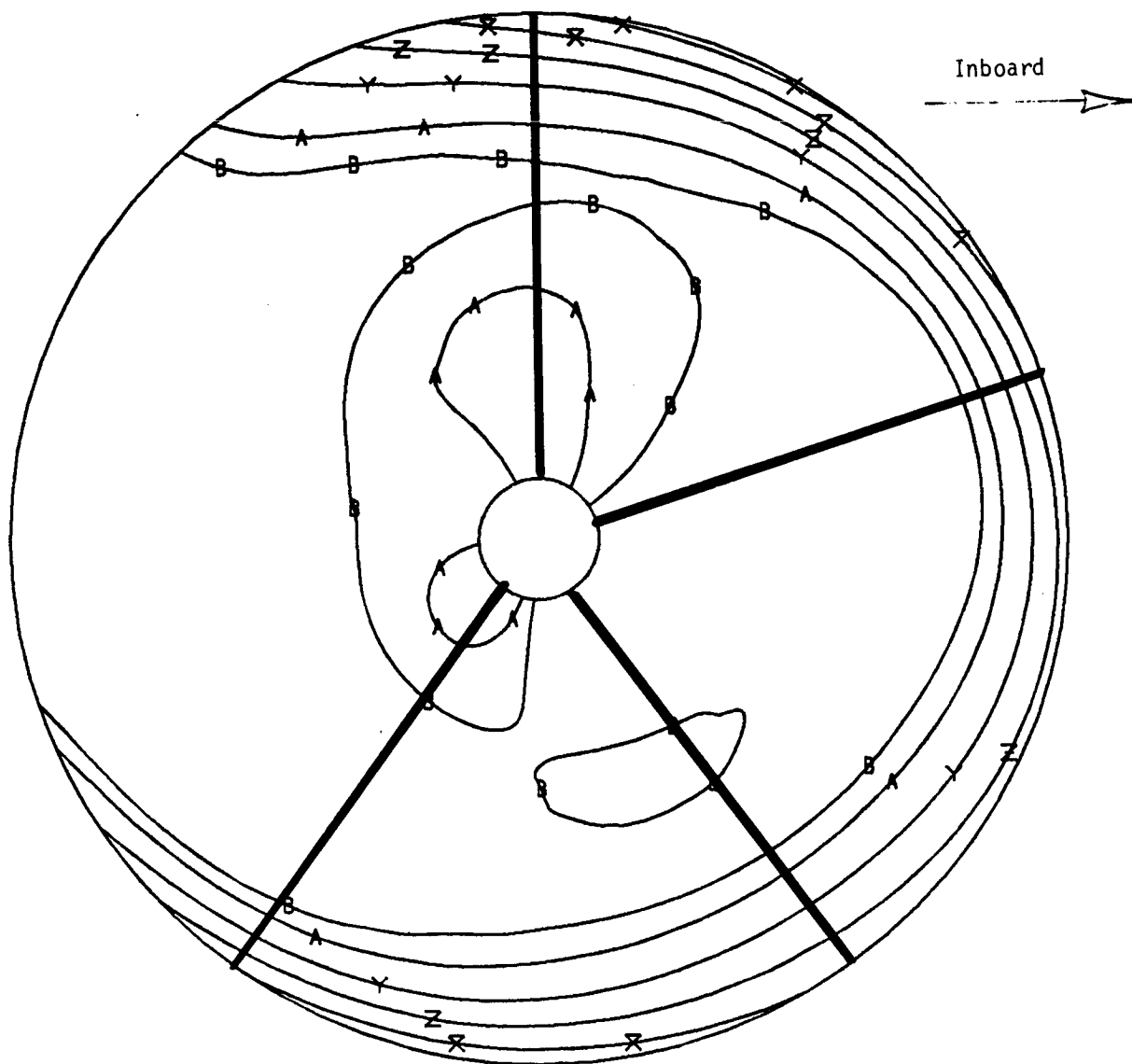
# DISORTION AND RECOVERY VERSUS ANGLE OF ATTACK RIGHT HAND INLET - FLOW-THROUGH MODE

	SYM	TEST	RUN	RMACH	RMFRA	RDEL CR
DF1	□	514	112	0.5978	0.3531	-4.9913
	▲	514	137	0.5991	0.5265	-4.9686
	◆	514	152	0.5983	0.7036	-4.9270
	○	514	172	0.5994	0.9207	-4.9497



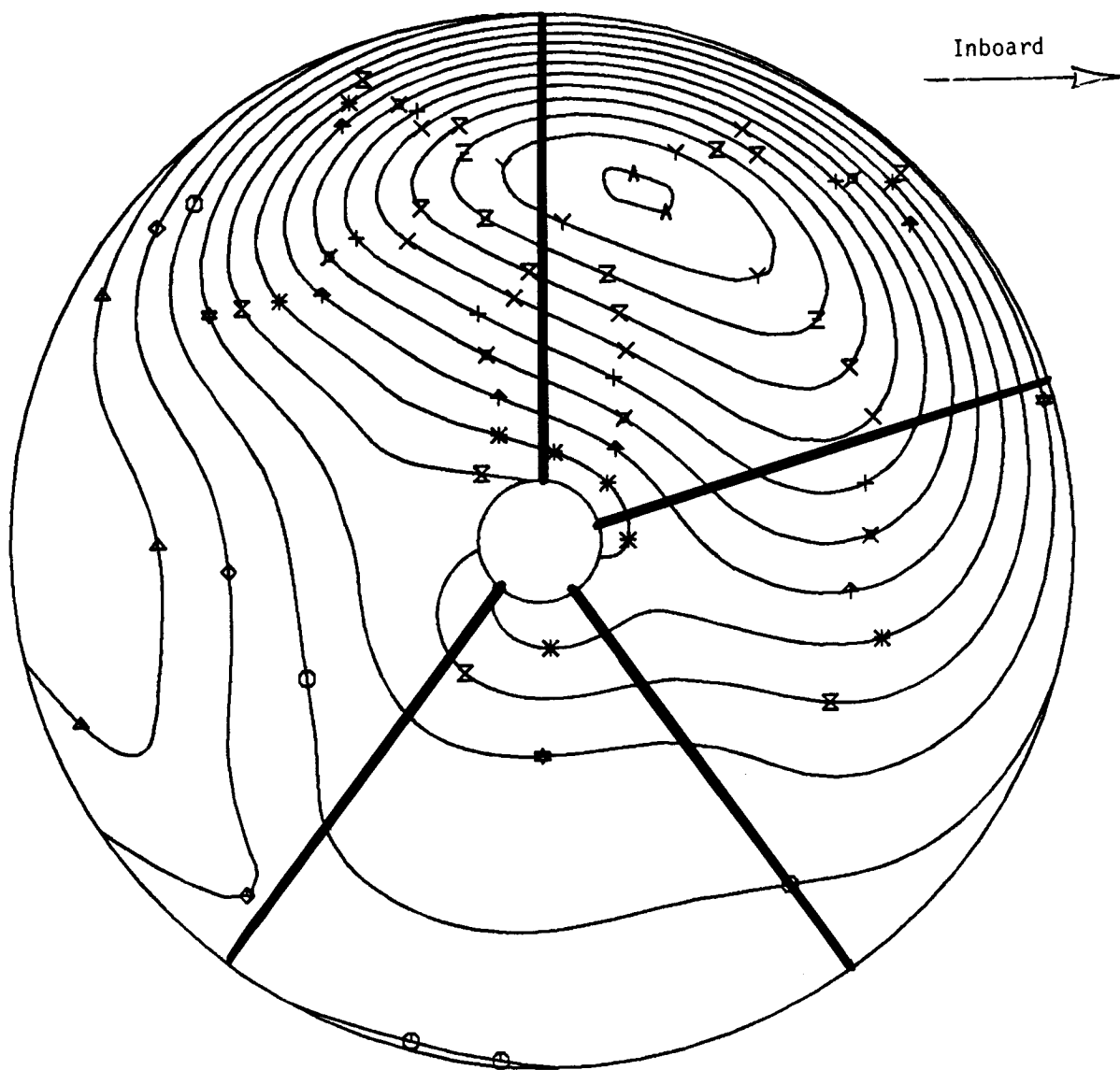
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	REC1R	DF1R
514	172	0.5994	.00428	0.9204	-4.9497	0.9809	0.0737
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—⊗—	0.80000
—*—	0.82000		—↑—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—⊗—	0.92000
—Z—	0.94000		—Y—	0.96000		—▲—	0.98000
—B—	0.99000						



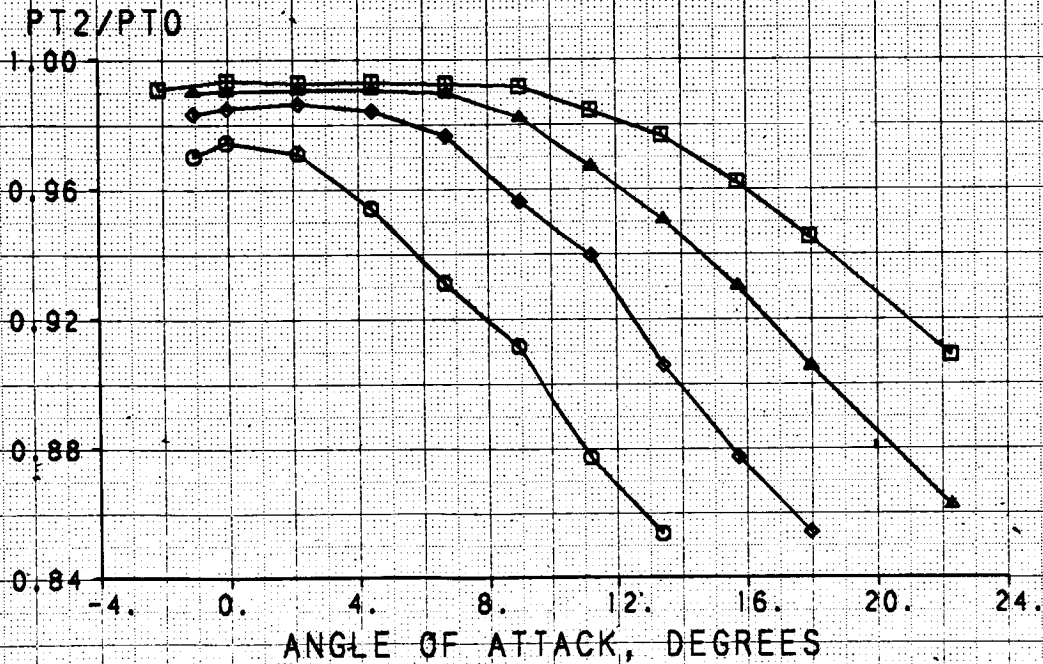
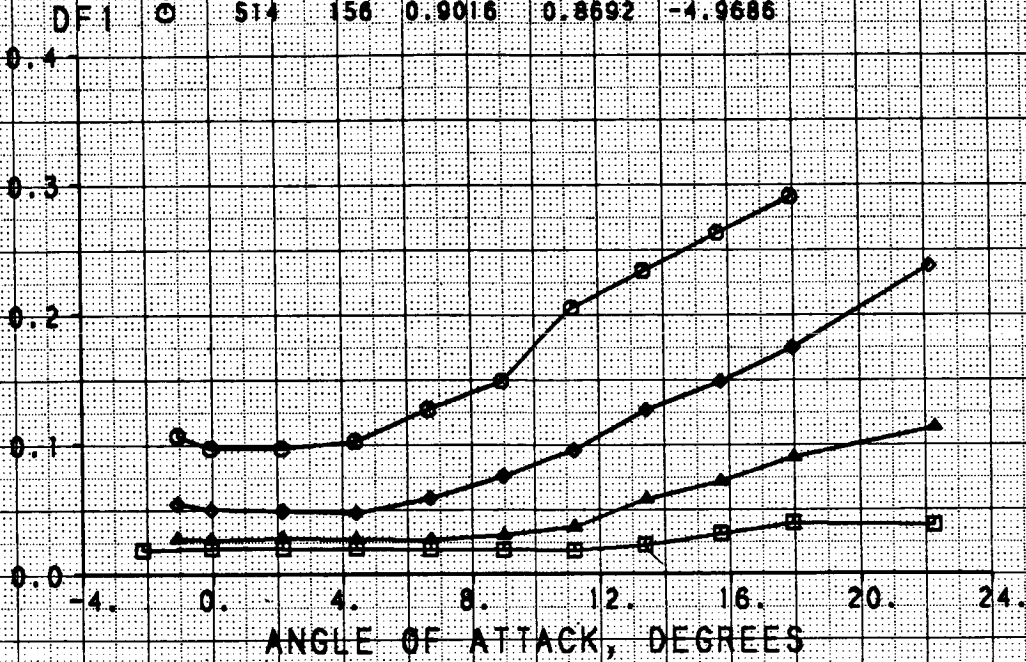
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	172	0.5994	17.299	0.7943	-4.9497	0.8199	0.2761
□	0.70000	▲	0.72000	◆	0.74000		
⊖	0.76000	●	0.78000	⊠	0.80000		
*	0.82000	↑	0.84000	✕	0.86000		
+	0.88000	✕	0.90000	✕	0.92000		
z	0.94000	✕	0.96000	✕	0.98000		
⊖	0.99000						



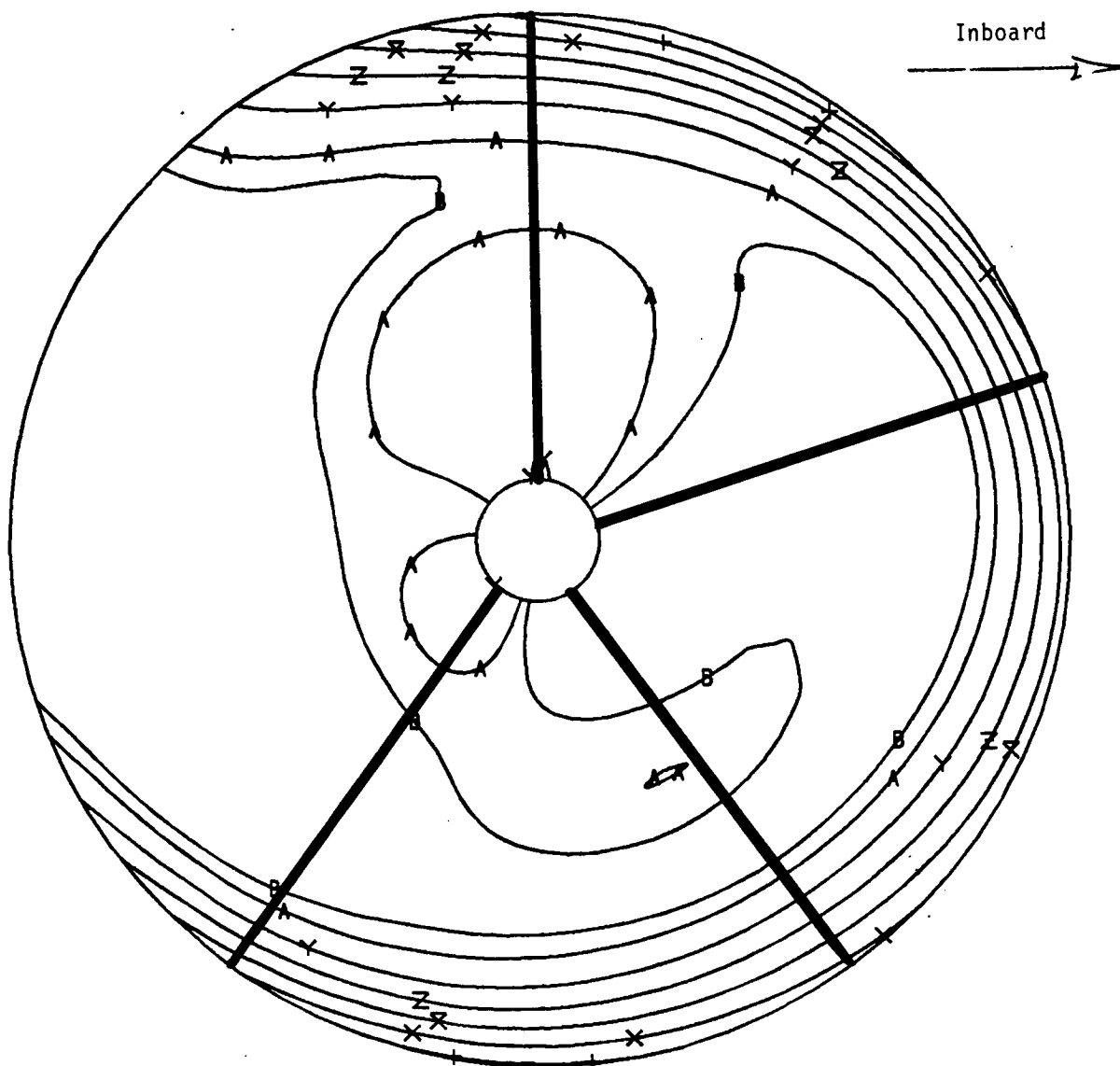
# DISTORTION AND RECOVERY VERSUS ANGLE OF ATTACK RIGHT HAND INLET - FLOW-THROUGH MODE

SYM	TEST	RUN	RMACH	RMERA	RDEL CR
□	514	117	0.8964	0.3485	-4.9799
▲	514	133	0.9016	0.5176	-4.9232
●	514	147	0.9052	0.7063	-4.9875
○	514	156	0.9016	0.8692	-4.9686



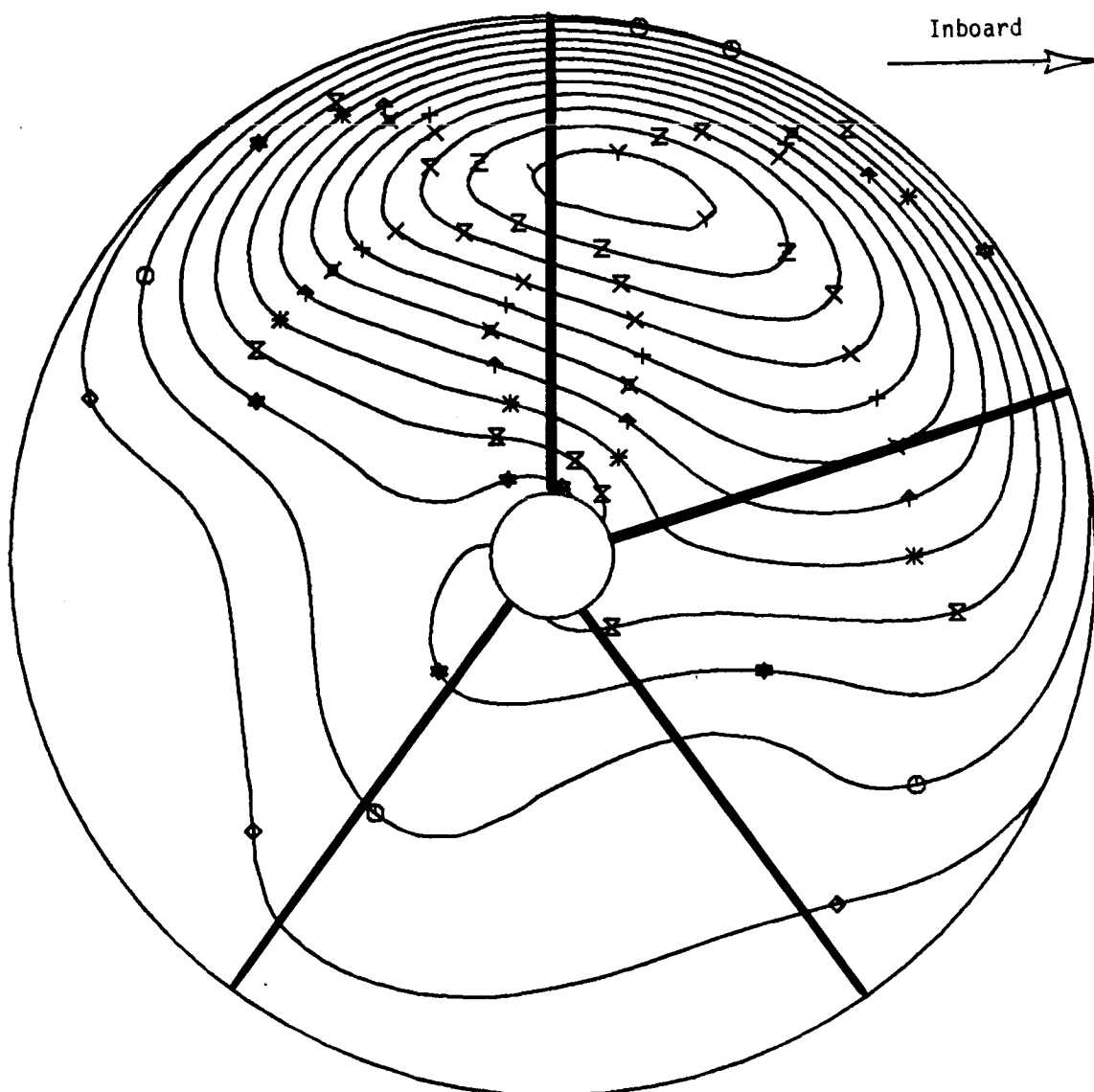
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	REC1R	DF1R
514	156	0.9016	-0.0414	0.8699	-4.9686	0.9748	0.1000
—■—	0.70000		—▲—	0.72000		—◆—	0.74000
—●—	0.76000		—◆—	0.78000		—■—	0.80000
—*—	0.82000		—▲—	0.84000		—x—	0.86000
—+—	0.88000		—x—	0.90000		—*—	0.92000
—z—	0.94000		—y—	0.96000		—+—	0.98000
—B—	0.99000						



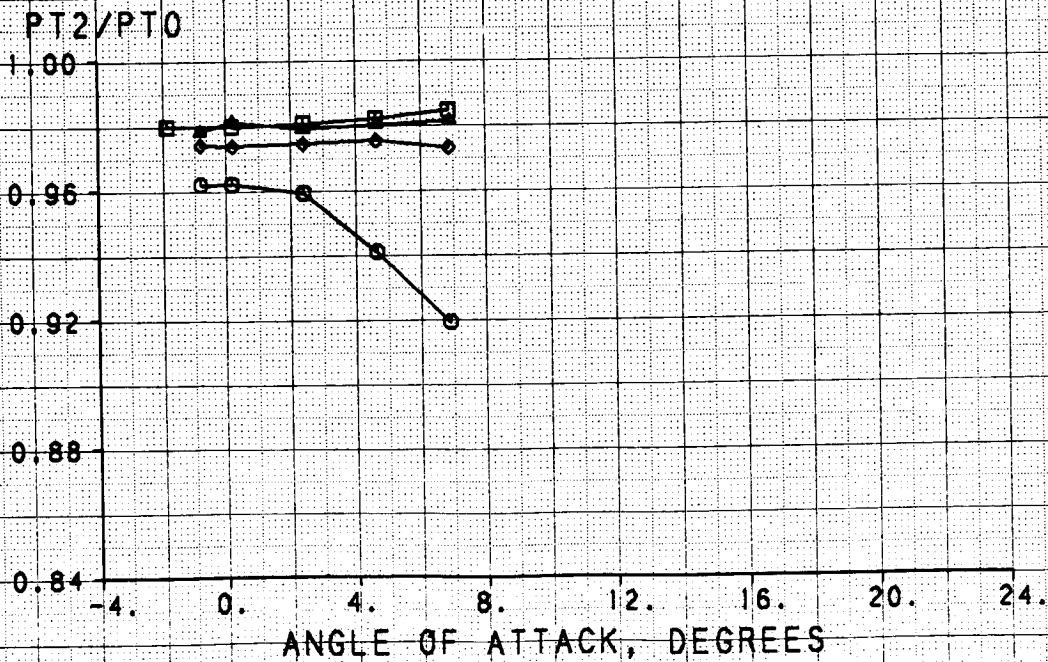
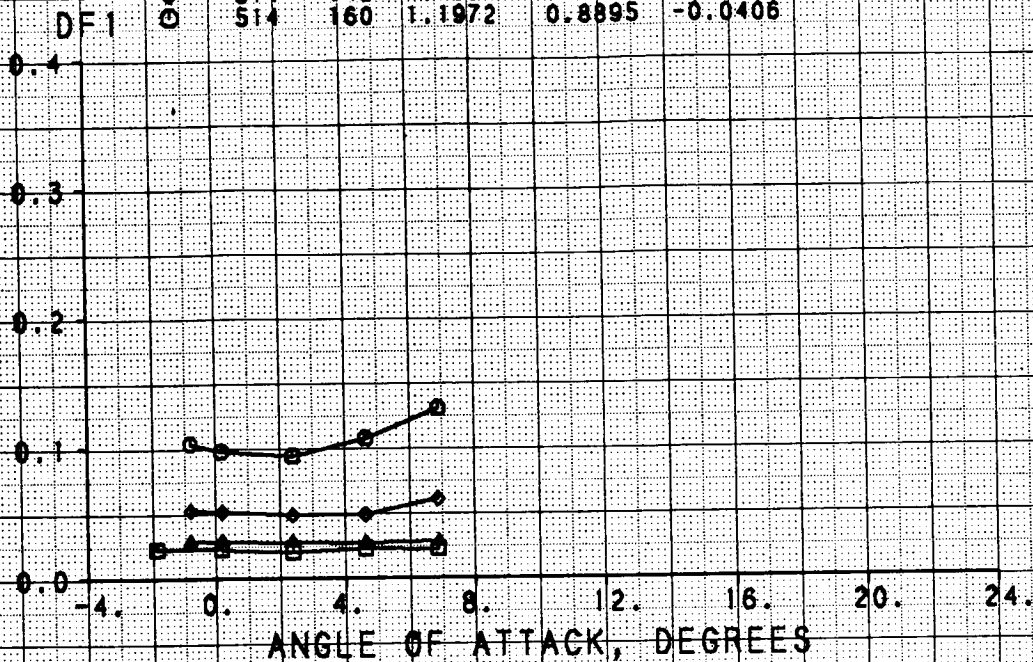
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	REC1R	DF1R
514	156	0.9016	17.908	0.6932	-4.9686	0.8042	0.2907
▣	0.70000	▲	0.72000	◆	0.74000		
⊖	0.76000	●	0.78000	⊞	0.80000		
*	0.82000	+	0.84000	×	0.86000		
+	0.88000	×	0.90000	⊗	0.92000		
z	0.94000	Y	0.96000	▲	0.98000		
8	0.99000						



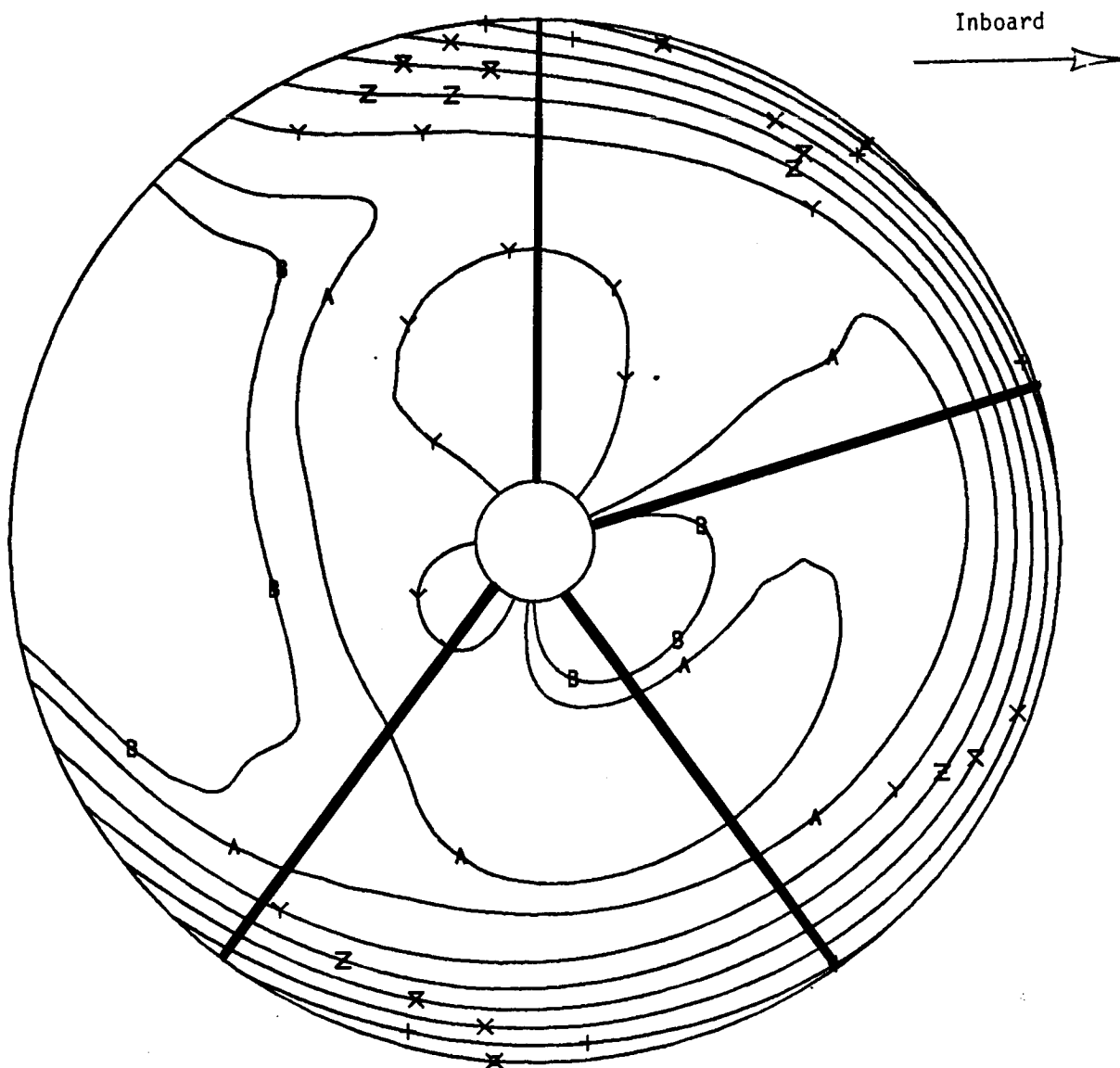
# DISTORTION AND RECOVERY VERSUS ANGLE OF ATTACK RIGHT HAND INLET - FLOW-THROUGH MODE

SYM	TEST	RUN	RMACH	RMFRA	RDELGR
□	514	121	1.1980	0.3523	.00182
▲	514	129	1.2004	0.5236	-0.0290
◇	514	145	1.1964	0.7123	-0.0519
○	514	160	1.1972	0.8895	-0.0406



# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

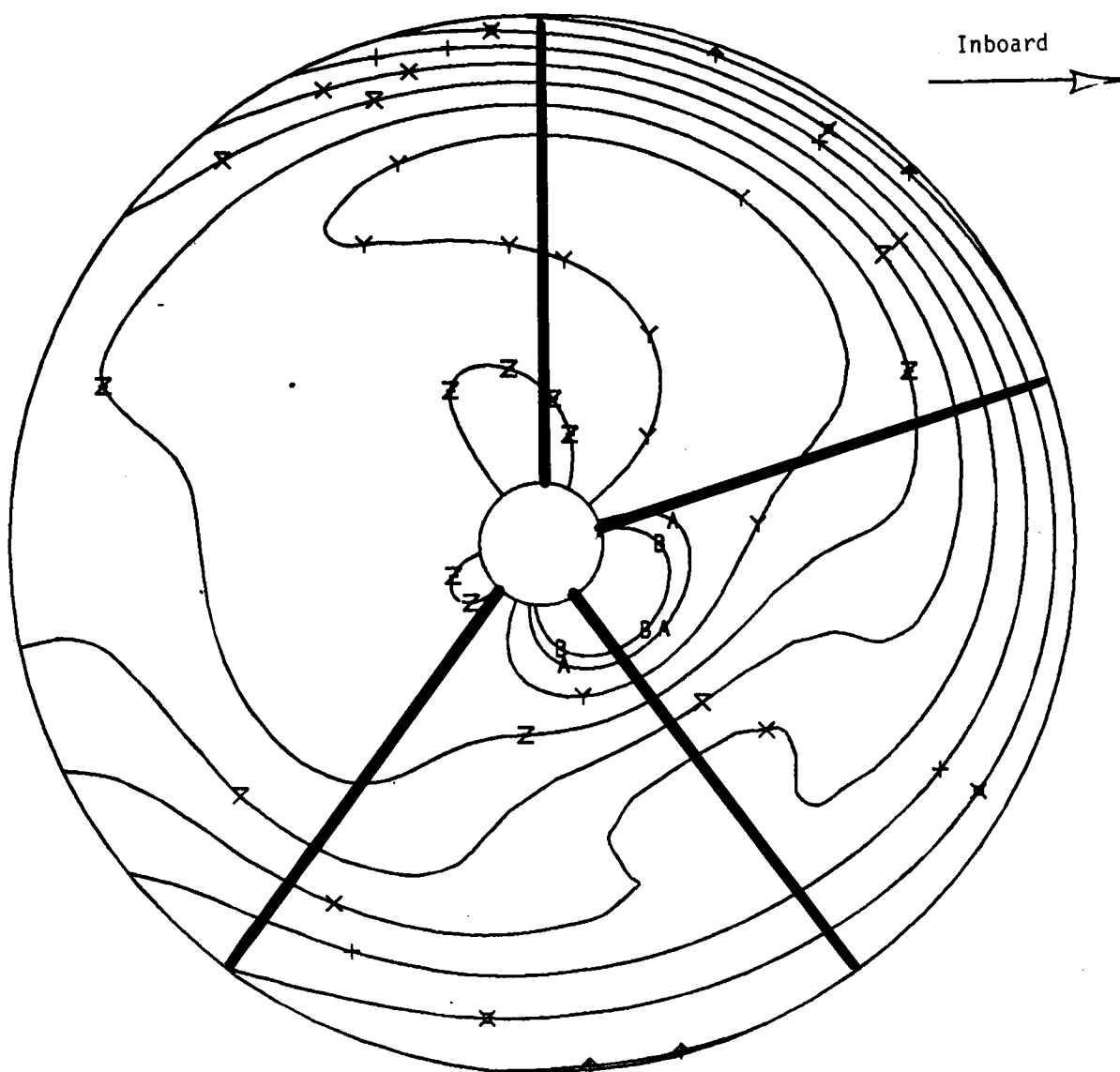
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	160	1.1972	0.2017	0.8878	-0.0406	0.9595	0.0950
□	0.70000		▲	0.72000		◆	0.74000
○	0.76000		●	0.78000		⊠	0.80000
*	0.82000		↑	0.84000		×	0.86000
+	0.88000		×	0.90000		⊗	0.92000
z	0.94000		⋈	0.96000		★	0.98000
8	0.99000						





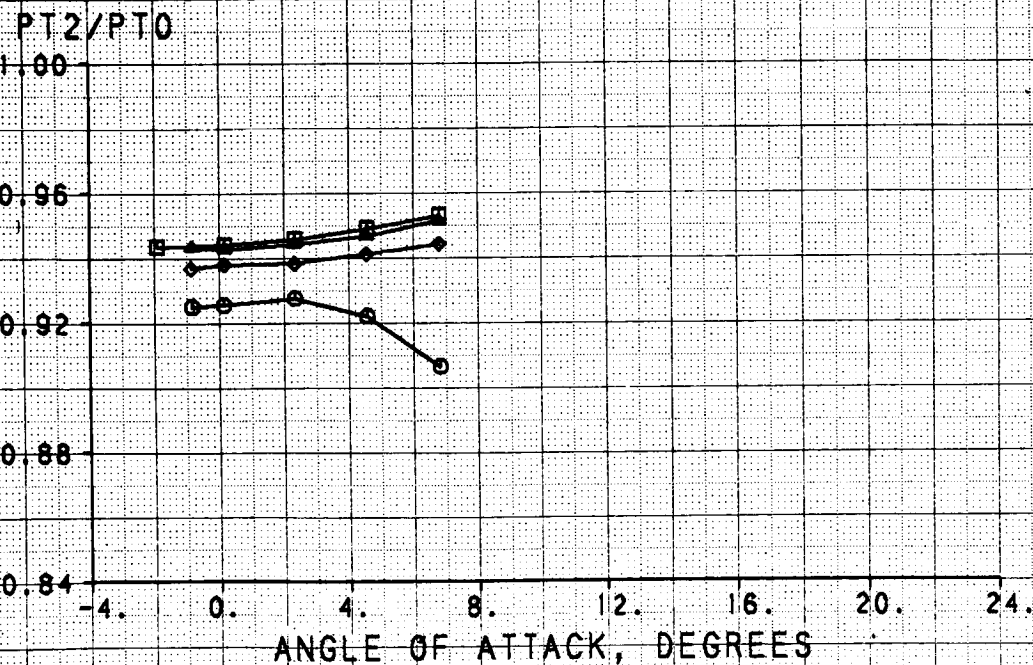
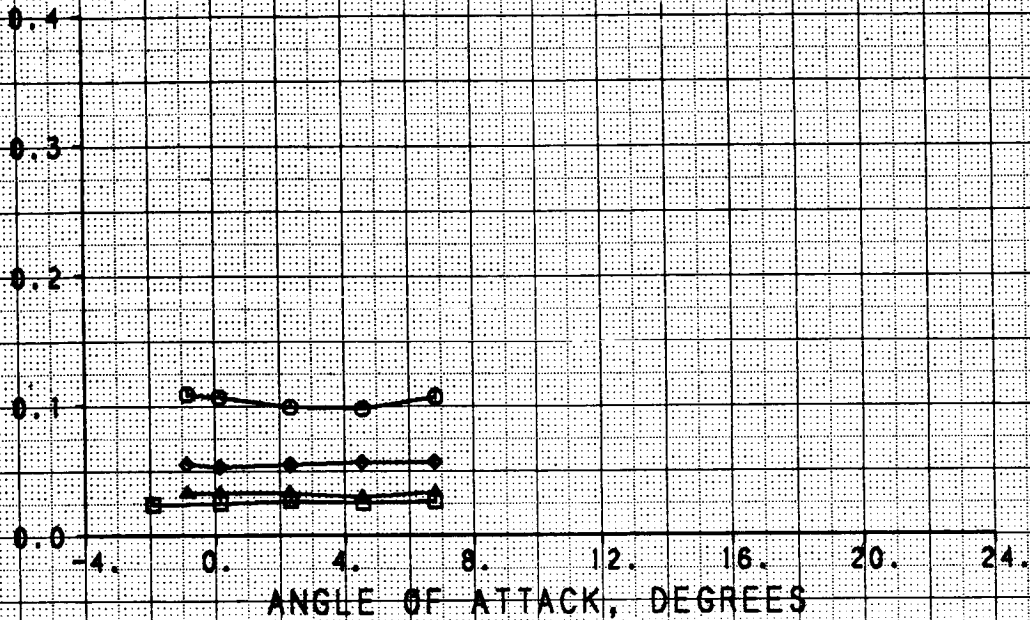
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	160	1.1972	6.8910	0.8553	-0.0406	0.9193	0.1308
—■—	0.70000		—▲—	0.72000		—◆—	0.74000
—⊖—	0.76000		—◆—	0.78000		—⊖—	0.80000
—*—	0.82000		—▲—	0.84000		—*—	0.86000
—+—	0.88000		—×—	0.90000		—+—	0.92000
—z—	0.94000		—y—	0.96000		—z—	0.98000
—b—	0.99000						



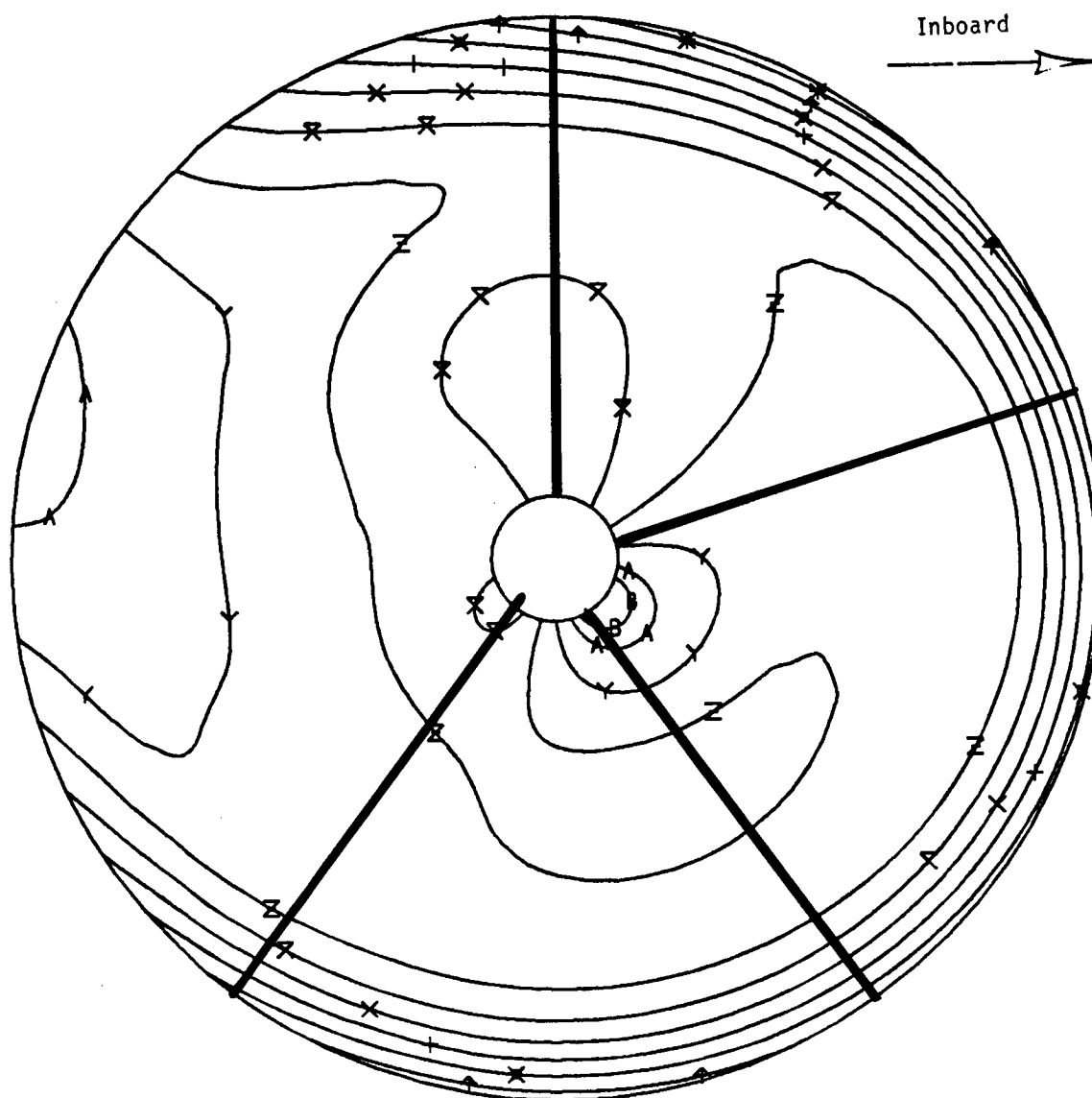
# DISTORTION AND RECOVERY VERSUS ANGLE OF ATTACK RIGHT HAND INLET - FLOW-THROUGH MODE

	SYM	TEST	RUN	RMACH	RMFRA	RDEL CR
DF1	□	514	124	1.3862	0.3654	0.0249
	▲	514	126	1.3953	0.5445	-0.0406
	◆	514	142	1.3983	0.7423	-0.0521
	○	514	161	1.3940	0.9250	-0.0251



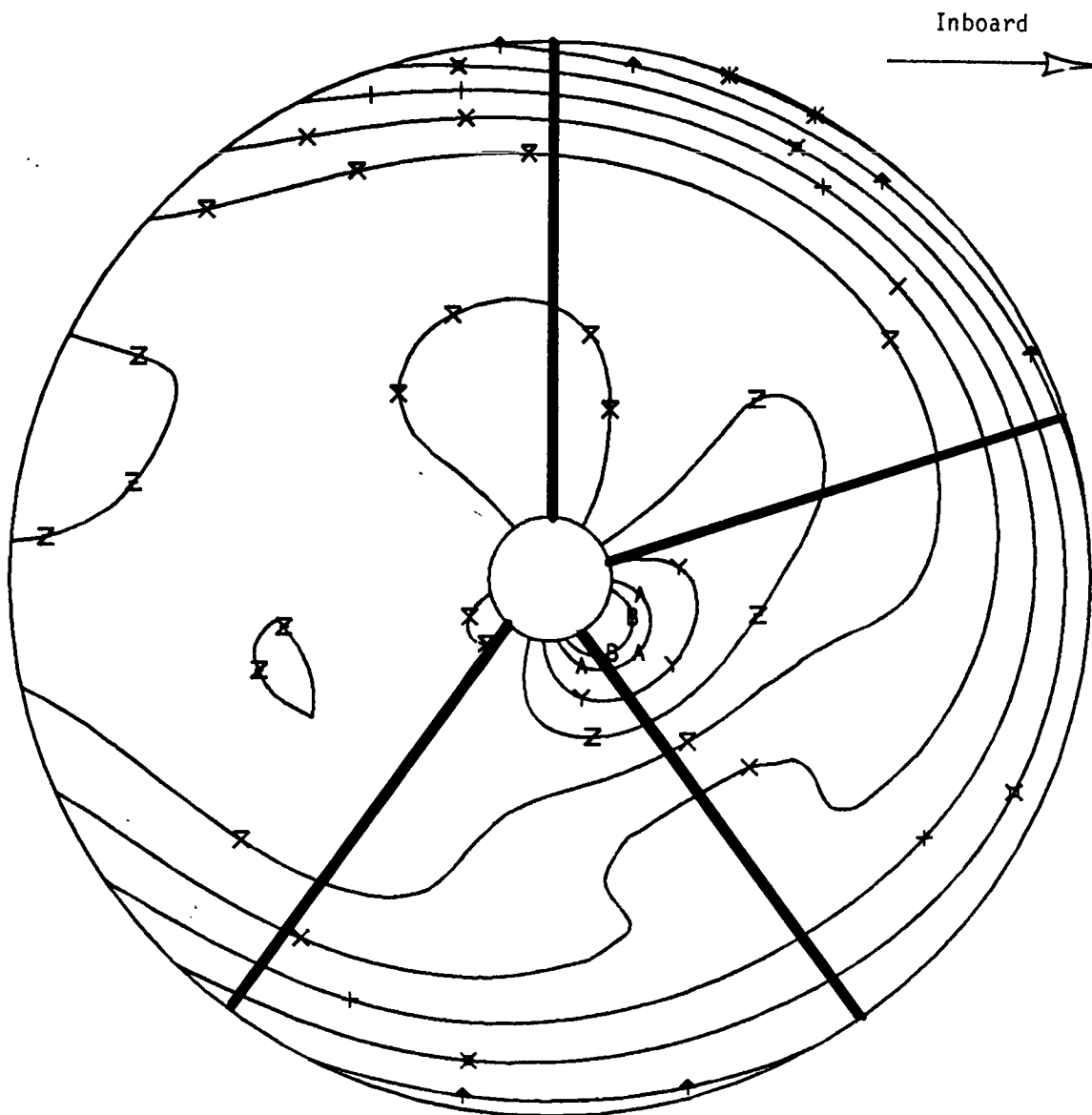
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	161	1.3940	0.1793	0.9260	-0.0251	0.9266	0.1058
—■—	0.70000		—▲—	0.72000		—◆—	0.74000
—●—	0.76000		—◆—	0.78000		—■—	0.80000
—*—	0.82000		—▲—	0.84000		—x—	0.86000
—+—	0.88000		—x—	0.90000		—*—	0.92000
—z—	0.94000		—y—	0.96000		—▲—	0.98000
—o—	0.99000						



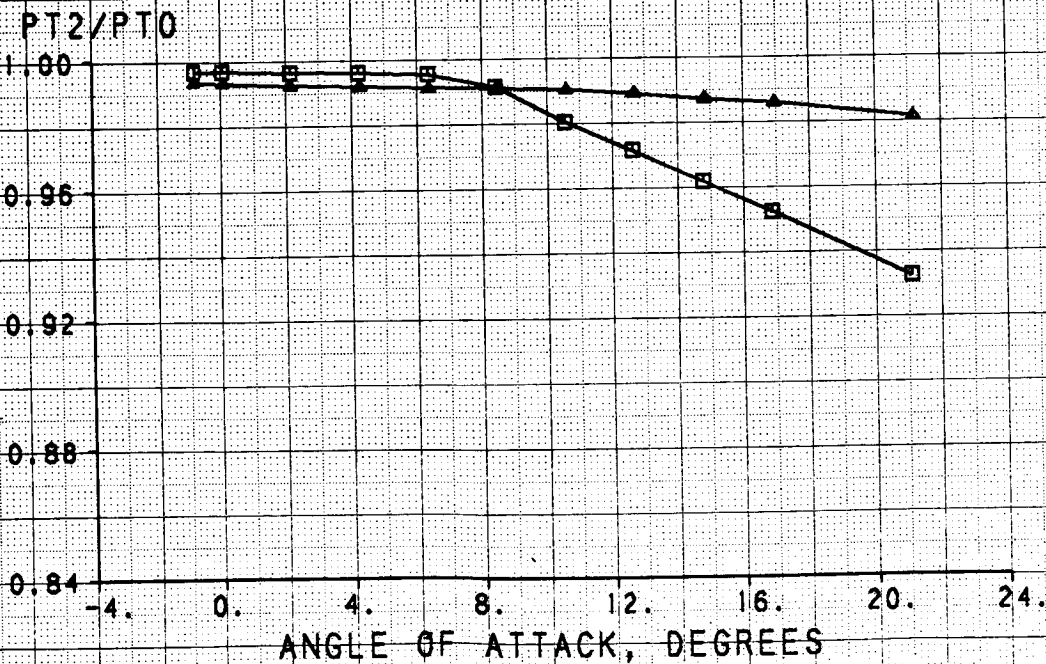
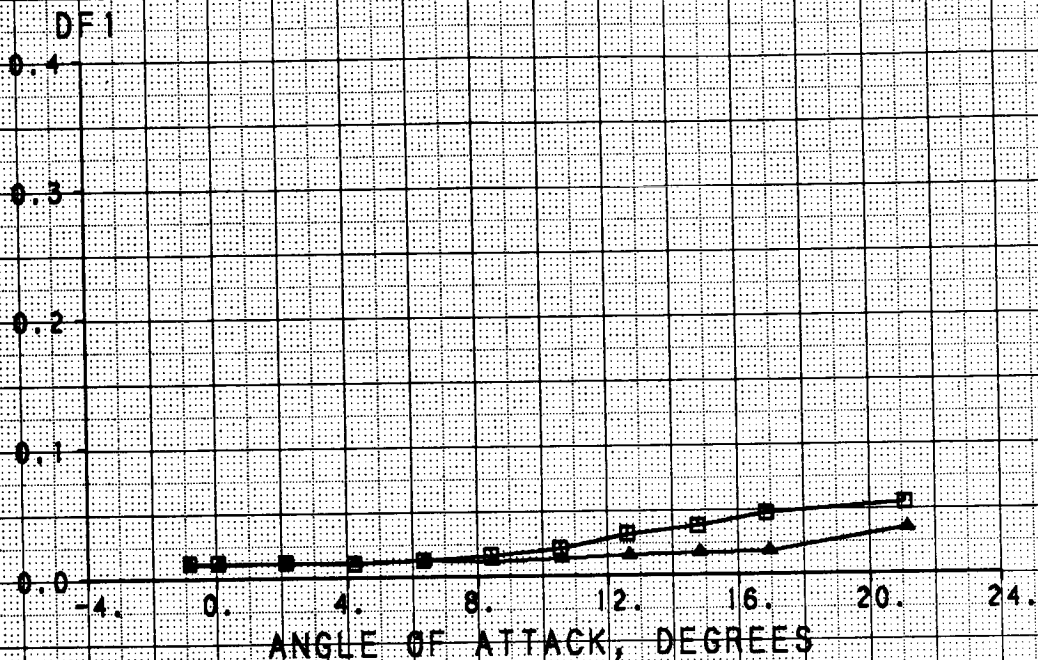
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	REC1R	DF1R
514	161	1.3940	6.8135	0.9084	-0.0251	0.9066	0.1070
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—⊗—	0.80000
—*—	0.82000		—↑—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—⦿—	0.92000
—z—	0.94000		—y—	0.96000		—▲—	0.98000
—B—	0.99000						



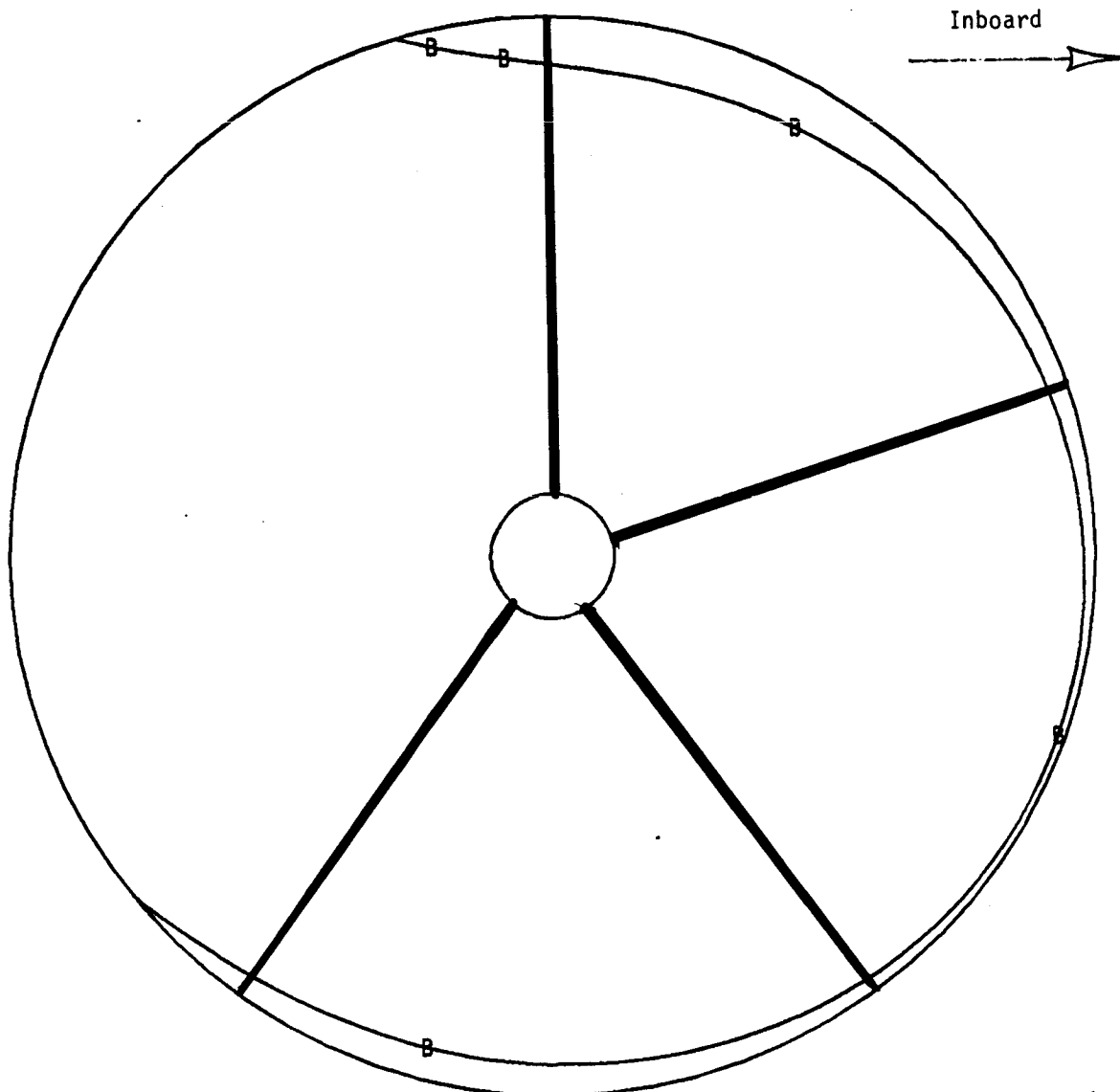
# DISTORTION AND RECOVERY VERSUS ANGLE OF ATTACK RIGHT HAND INLET - FLOW-THROUGH MODE

SYM	TEST	RUN	RMACH	RMFRA	RDELCR	DESCRIPTION
□	514	187	0.3995	0.5537	-0.00204	FLOW-THROUGH MODE WITH EJECTORS
△	514	187	0.3992	0.5527	-0.0408	FLOW-THROUGH MODE WITH DROOP-LIP INLET



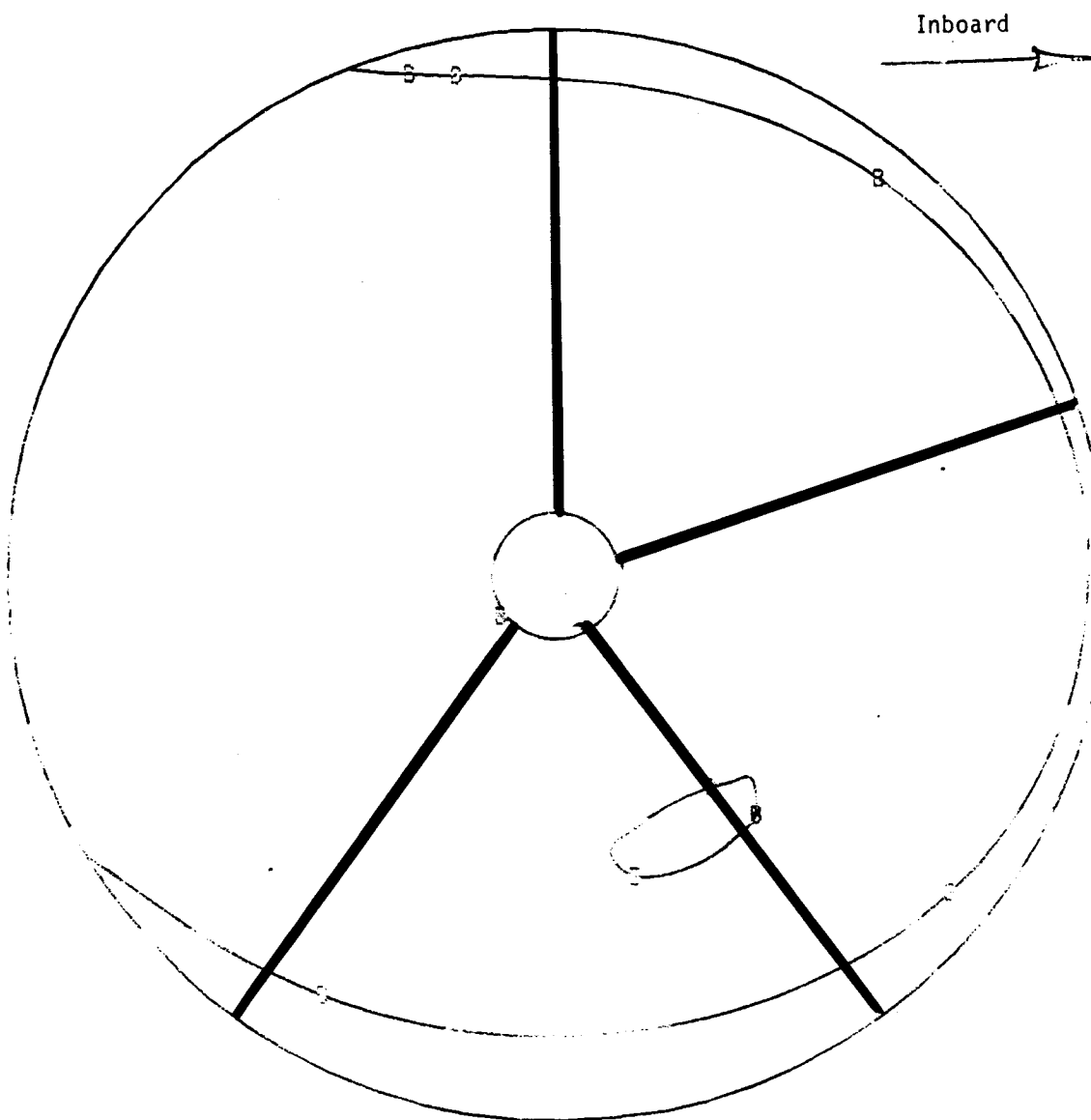
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	187	0.3995	0.0828	0.5535	-.00204	0.9967	0.0127
—□—	0.70000		—▲—	0.72000	—◆—	0.74000	
—○—	0.76000		—●—	0.78000	—■—	0.80000	
—*—	0.82000		—▲—	0.84000	—×—	0.86000	
—+—	0.88000		—×—	0.90000	—*—	0.92000	
—z—	0.94000		—y—	0.96000	—▲—	0.98000	
—B—	0.99000						



# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

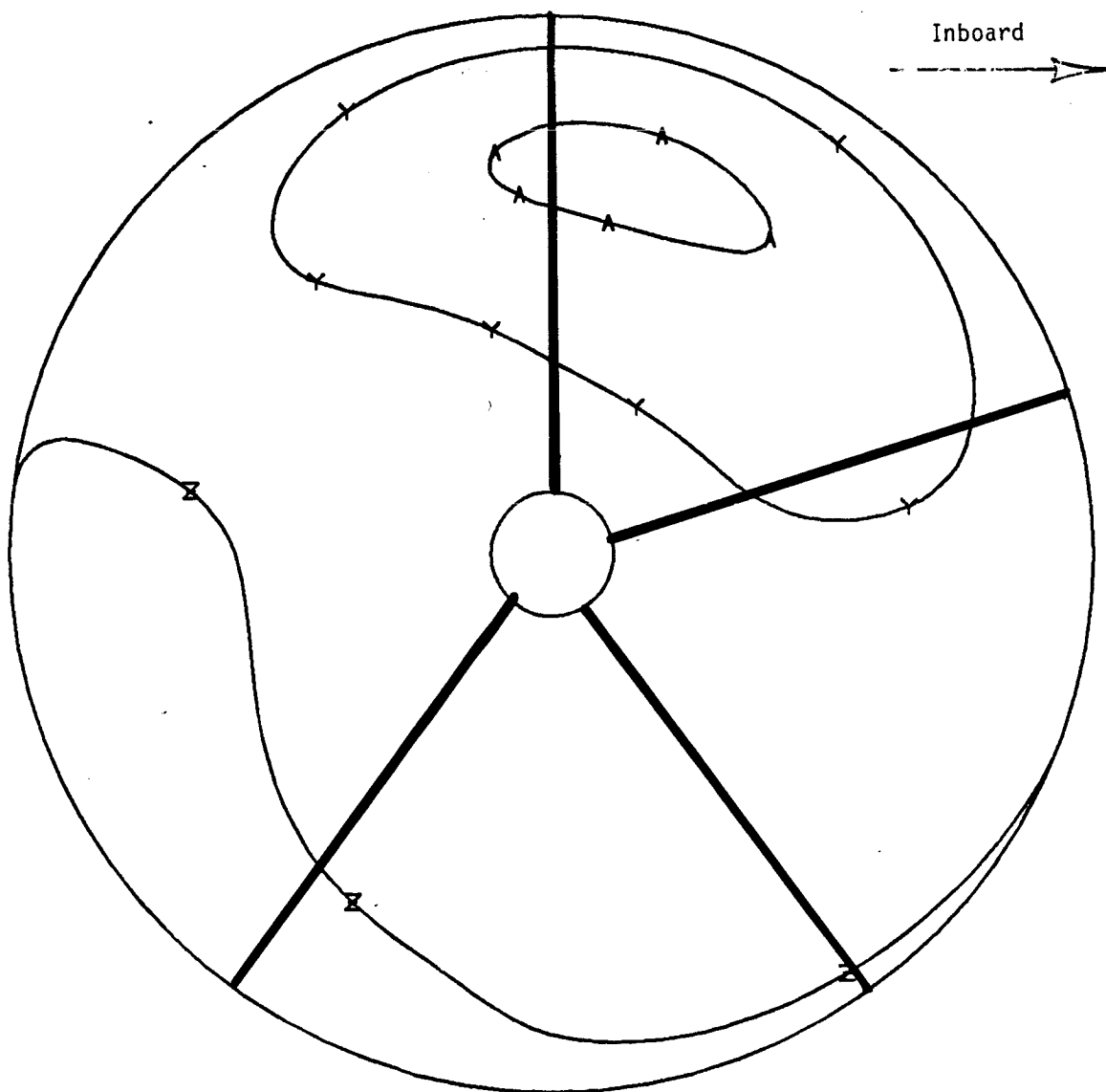
TEST	RUN	RMACH	ALPHAM	MERA	RDELCR	RECIR	DEIR
514	197	0.3992	0.0872	0.5530	-0.0408	0.9004	0.9114
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—◆—	0.78000		—⊗—	0.80000
—*—	0.82000		—†—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—⋈—	0.92000
—=—	0.94000		—Y—	0.96000		—★—	0.98000
—@—	0.99000						



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# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

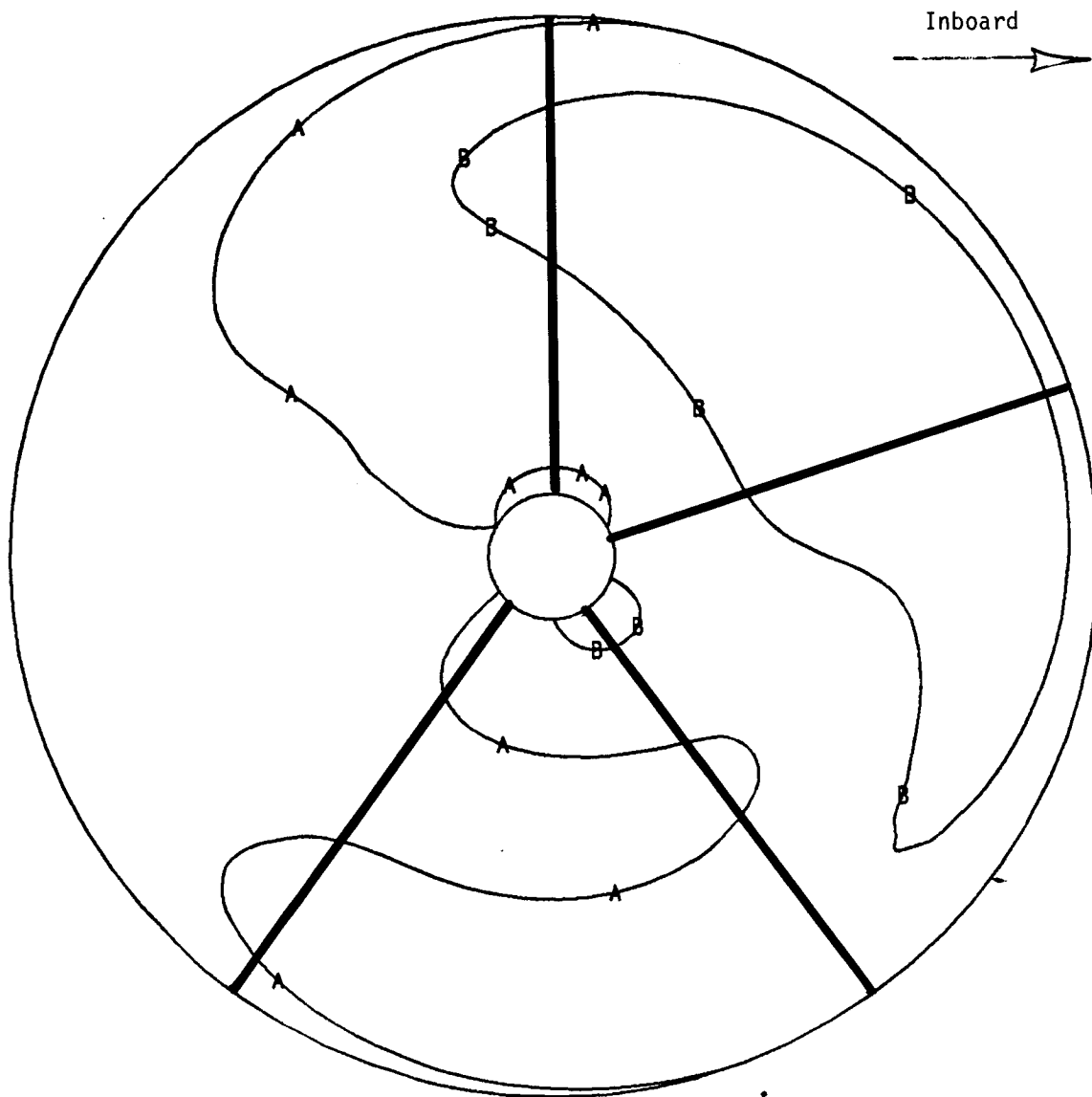
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	187	0.3995	16.861	0.5310	-.00204	0.9525	0.0475
—■—	0.70000		—▲—	0.72000		—◆—	0.74000
—●—	0.76000		—◆—	0.78000		—■—	0.80000
—*—	0.82000		—▲—	0.84000		—*—	0.86000
—+—	0.88000		—x—	0.90000		—x—	0.92000
—z—	0.94000		—y—	0.96000		—▲—	0.98000
—8—	0.99000						





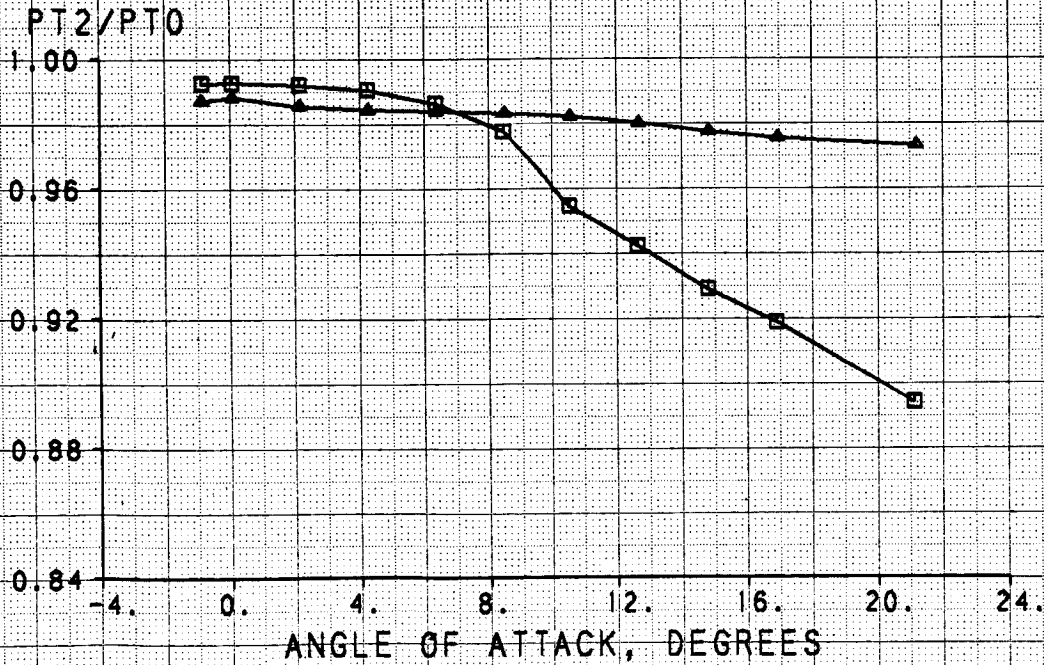
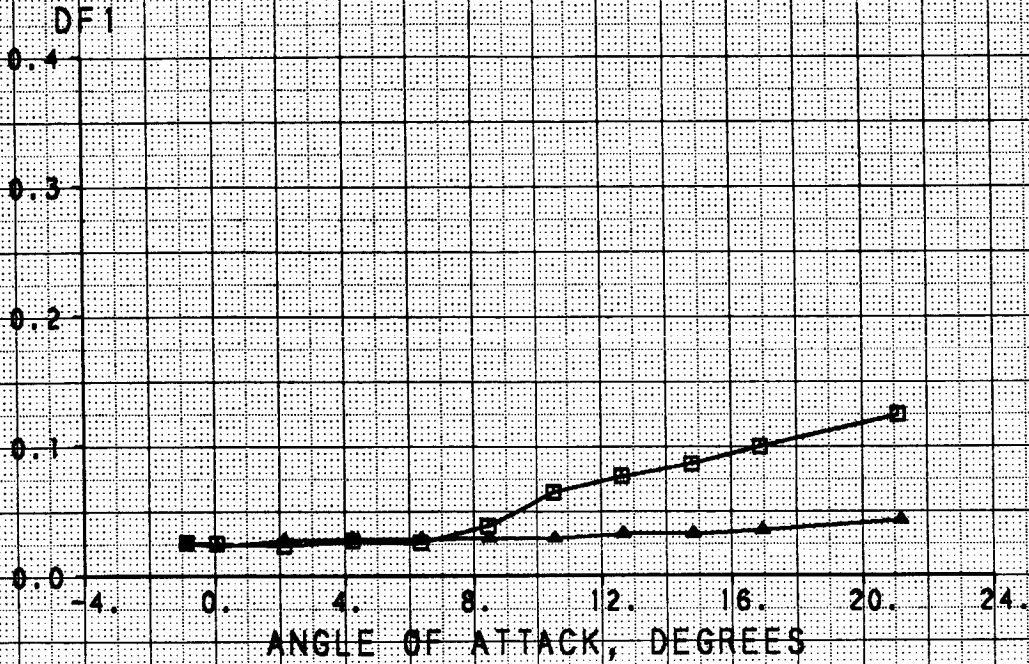
COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION  
RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	REC1R	DF1R
514	197	0.3992	16.944	0.5497	-0.0406	0.9859	0.0183
—■—	0.70000		—▲—	0.72000		—◆—	0.74000
—⊙—	0.76000		—●—	0.78000		—⊗—	0.80000
—✱—	0.82000		—†—	0.84000		—✱—	0.86000
—+—	0.88000		—✕—	0.90000		—✕—	0.92000
—z—	0.94000		—y—	0.96000		—★—	0.98000
—B—	0.99000						



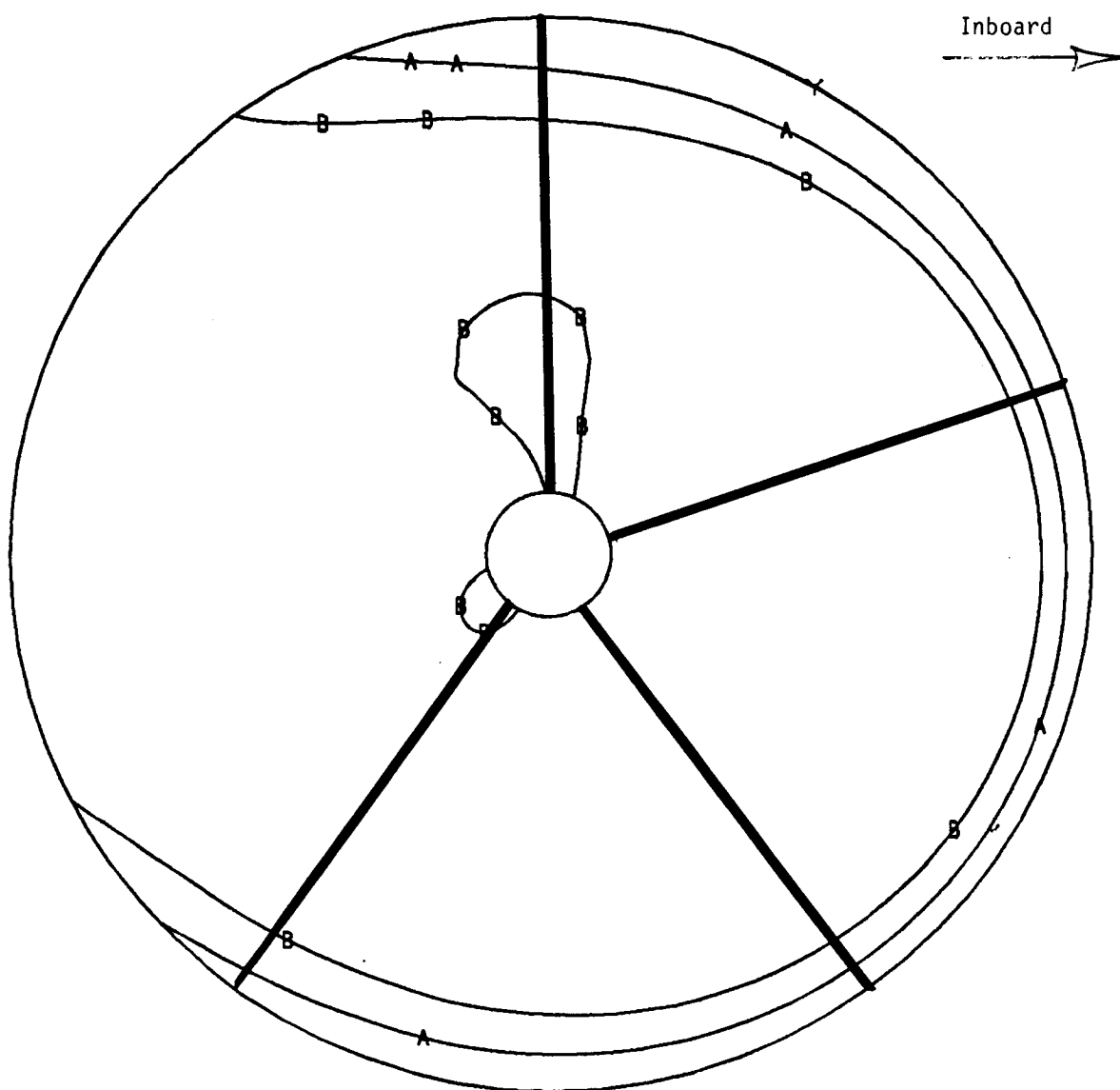
# DISTORTION AND RECOVERY VERSUS ANGLE OF ATTACK RIGHT HAND INLET - FLOW-THROUGH MODE

SYM	TEST	RUN	RMACH	RNERA	RDELTA	DESCRIPTION
□	514	205	0.3982	0.8219	-0.0483	FLOW-THROUGH MODE WITH EJECTORS
▲	514	202	0.3983	0.7757	-0.0521	FLOW-THROUGH MODE WITH DROOP-LIP INLET



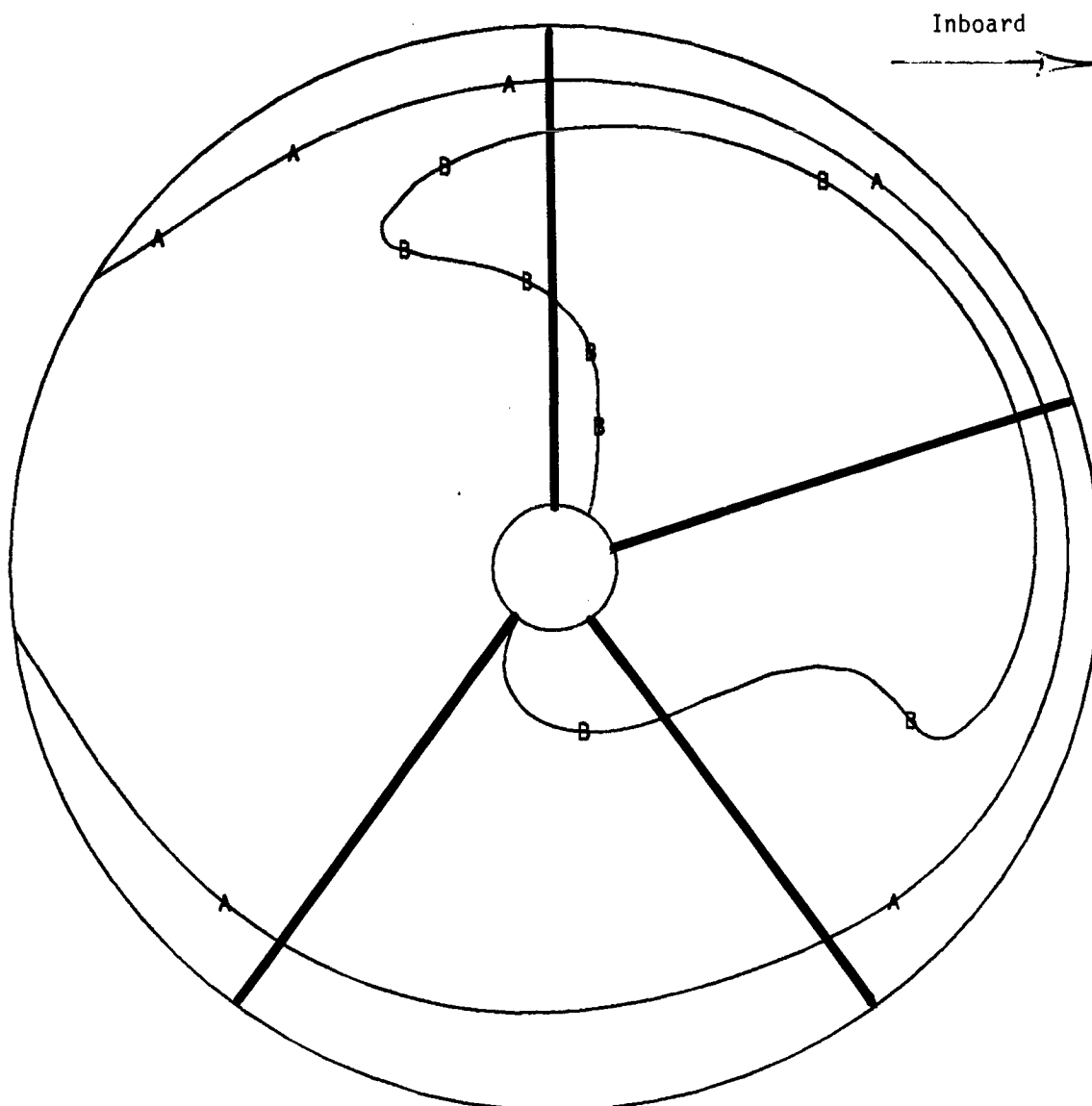
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	205	0.3982	0.0825	0.8209	-0.0483	0.9923	0.0252
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—⊖—	0.76000		—●—	0.78000		—⊖—	0.80000
—✱—	0.82000		—↑—	0.84000		—✱—	0.86000
—+—	0.88000		—✕—	0.90000		—✕—	0.92000
—z—	0.94000		—y—	0.96000		—A—	0.98000
—B—	0.99000						



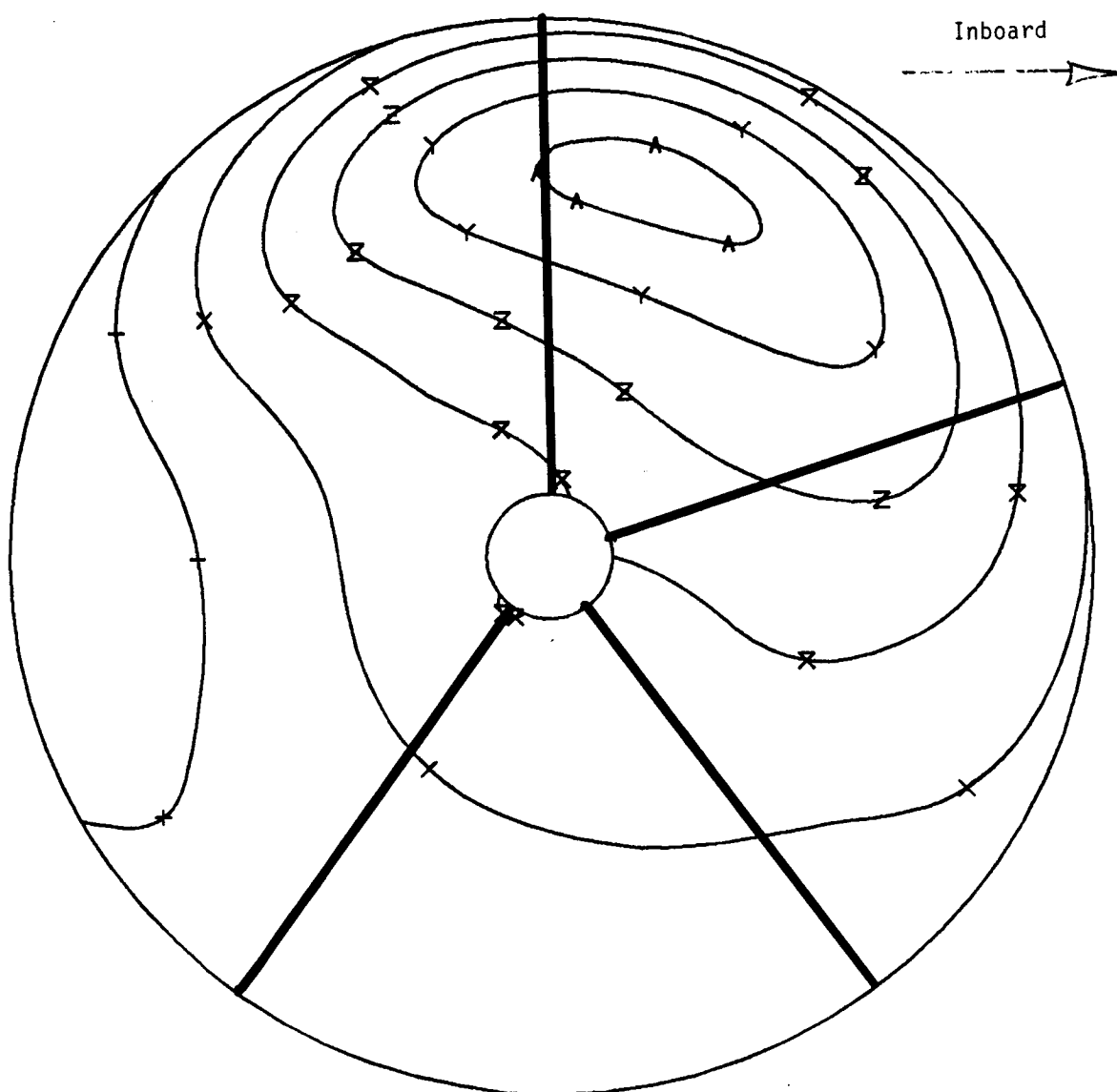
COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION  
RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	202	0.3993	0.0863	0.8338	-0.0521	0.9869	0.0265
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—■—	0.80000
—*—	0.82000		—▲—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—*—	0.92000
—Z—	0.94000		—Y—	0.96000		—▲—	0.98000
—B—	0.99000						



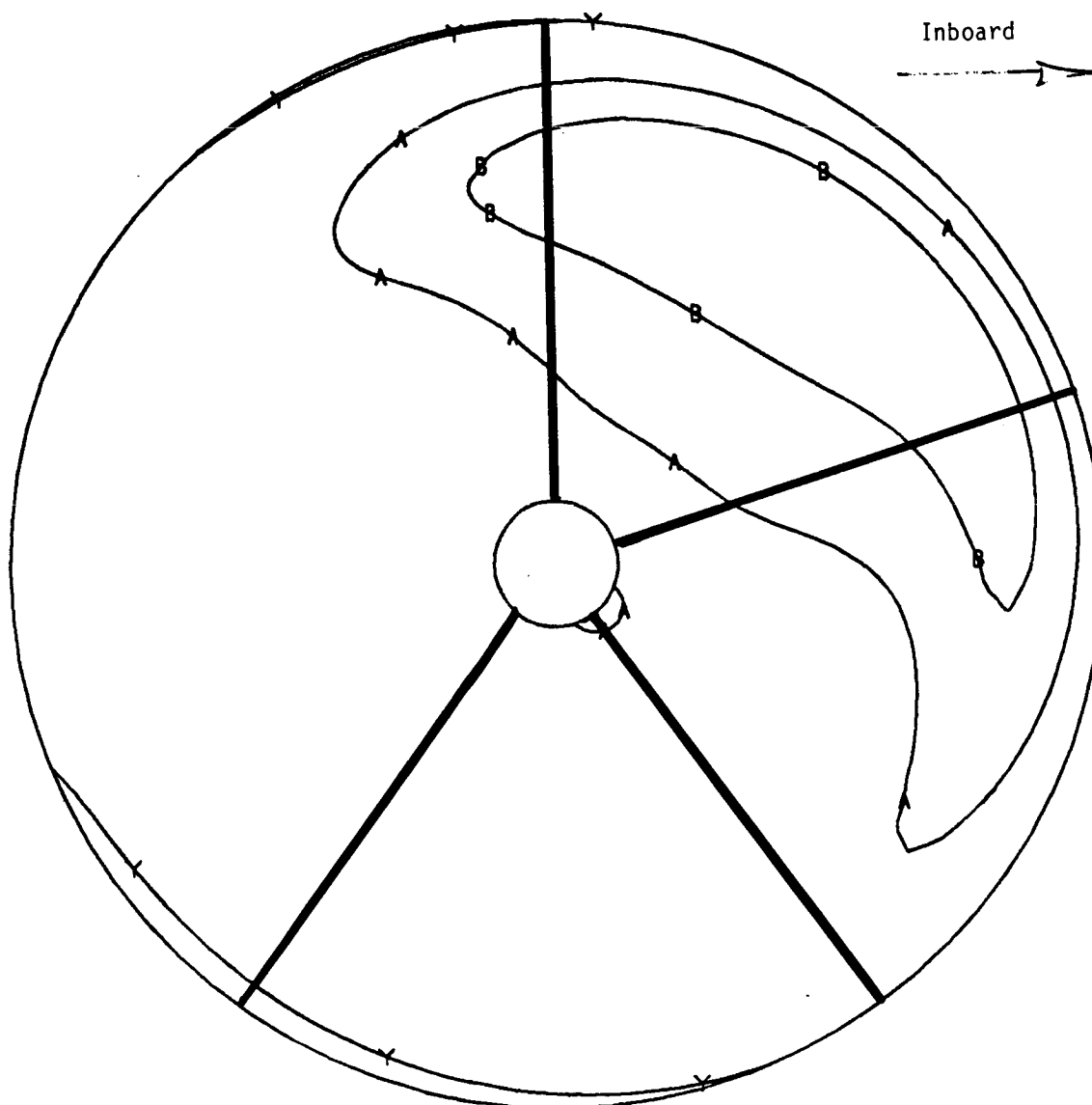
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

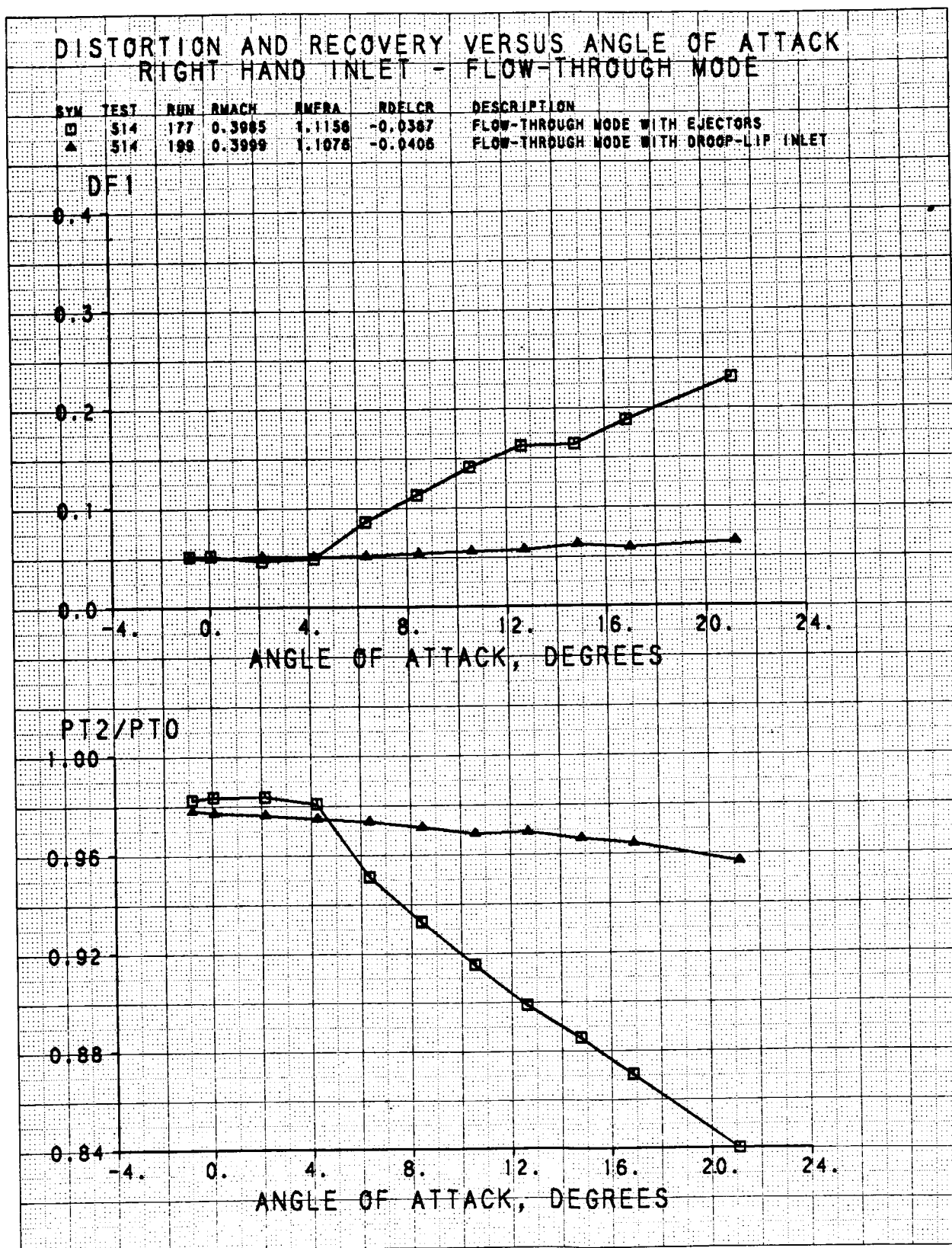
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	205	0.3982	16.892	0.7696	-0.0483	0.9190	0.0999
—■—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—⊠—	0.80000
—*—	0.82000		—↑—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—×—	0.92000
—z—	0.94000		—y—	0.96000		—▲—	0.98000
—8—	0.99000						



COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION  
RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

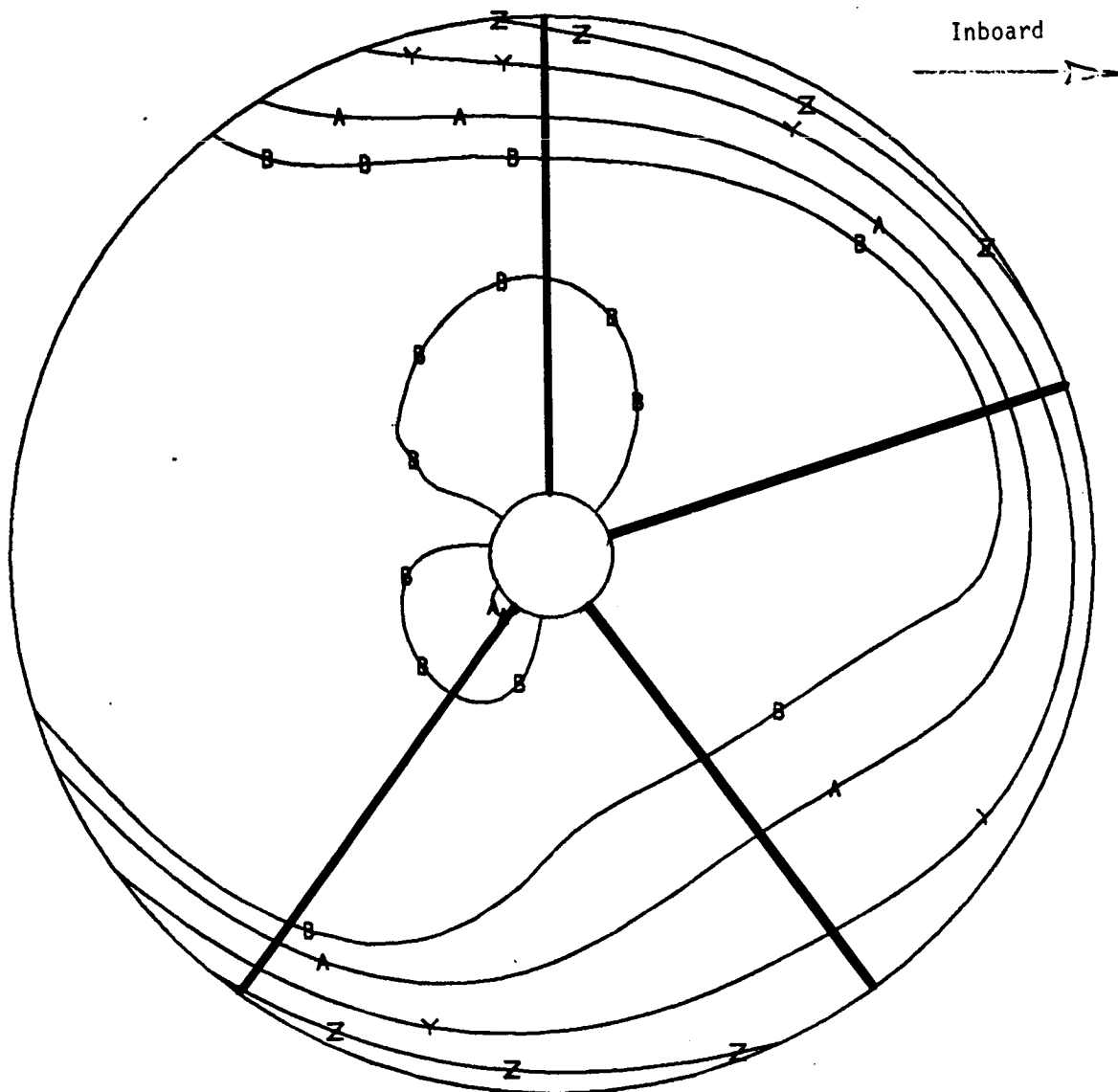
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	202	0.3993	16.947	0.7931	-0.0521	0.9756	0.0356
□	0.70000		▲	0.72000	◆	0.74000	
○	0.76000		◆	0.78000	■	0.80000	
*	0.82000		▲	0.84000	✕	0.86000	
+	0.88000		✕	0.90000	✕	0.92000	
z	0.94000		Y	0.96000	▲	0.98000	
8	0.99000						





# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

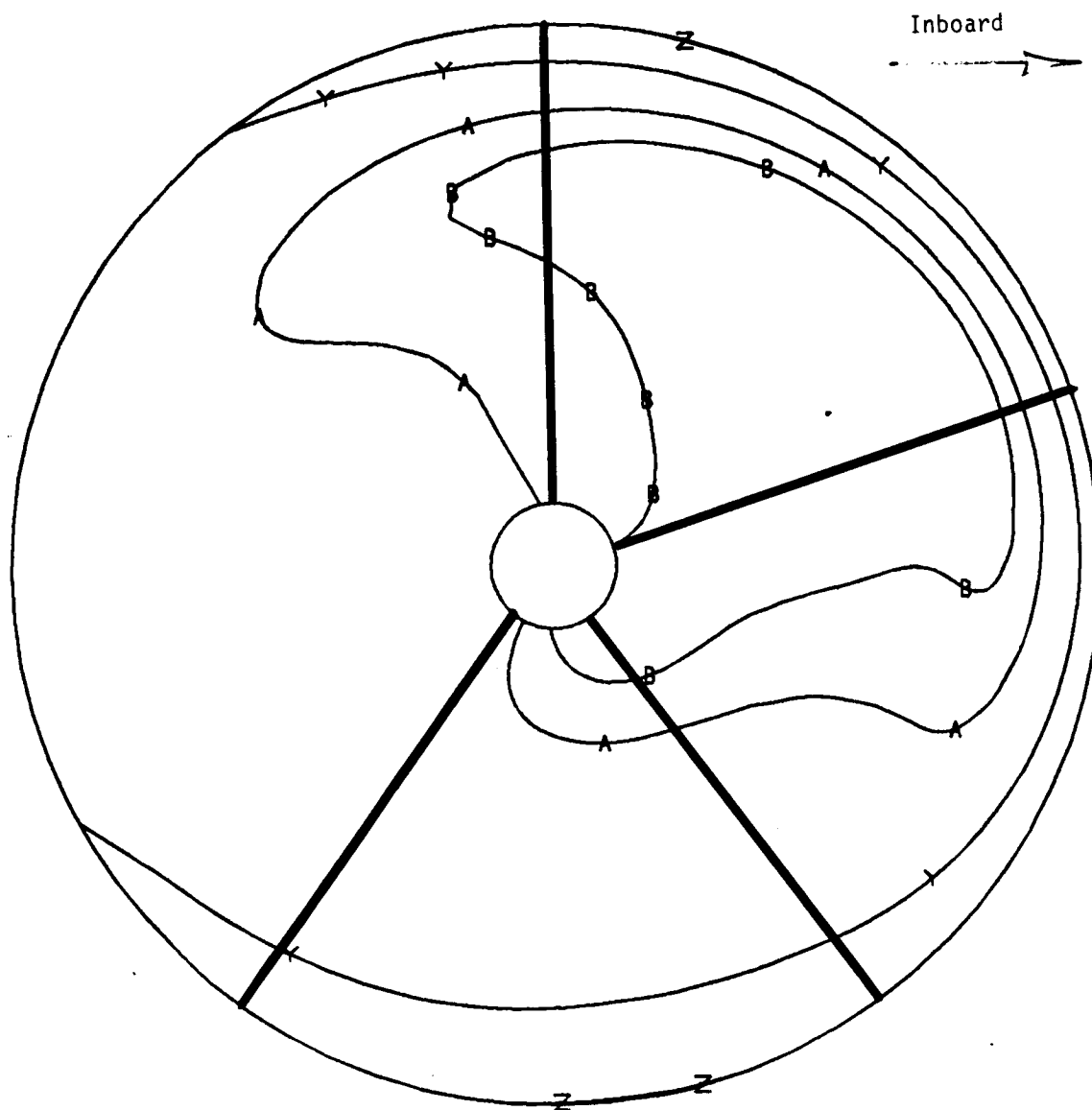
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	177	0.3985	0.0825	1.1170	-0.0367	0.9836	0.0527
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—■—	0.80000
—*—	0.82000		—↑—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—*—	0.92000
—z—	0.94000		—y—	0.96000		—A—	0.98000
—B—	0.99000						





# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

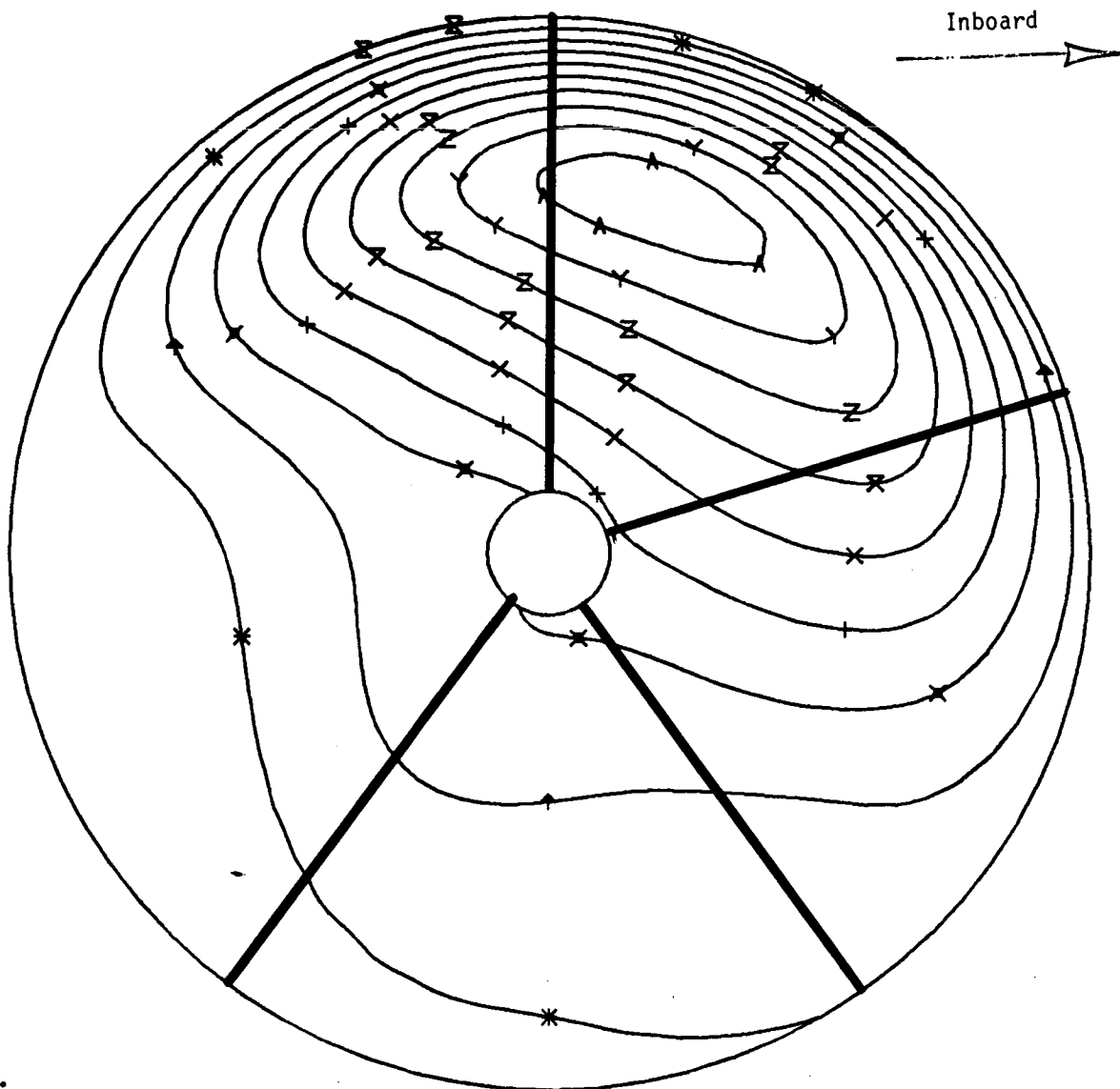
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	REC1R	DF1R
514	199	0.3999	0.0844	1.1052	-0.0406	0.9772	0.0496
□	0.70000		▲	0.72000		◆	0.74000
○	0.76000		◆	0.78000		■	0.80000
*	0.82000		▲	0.84000		×	0.86000
+	0.88000		×	0.90000		✕	0.92000
z	0.94000		✕	0.96000		▲	0.98000
8	0.99000						



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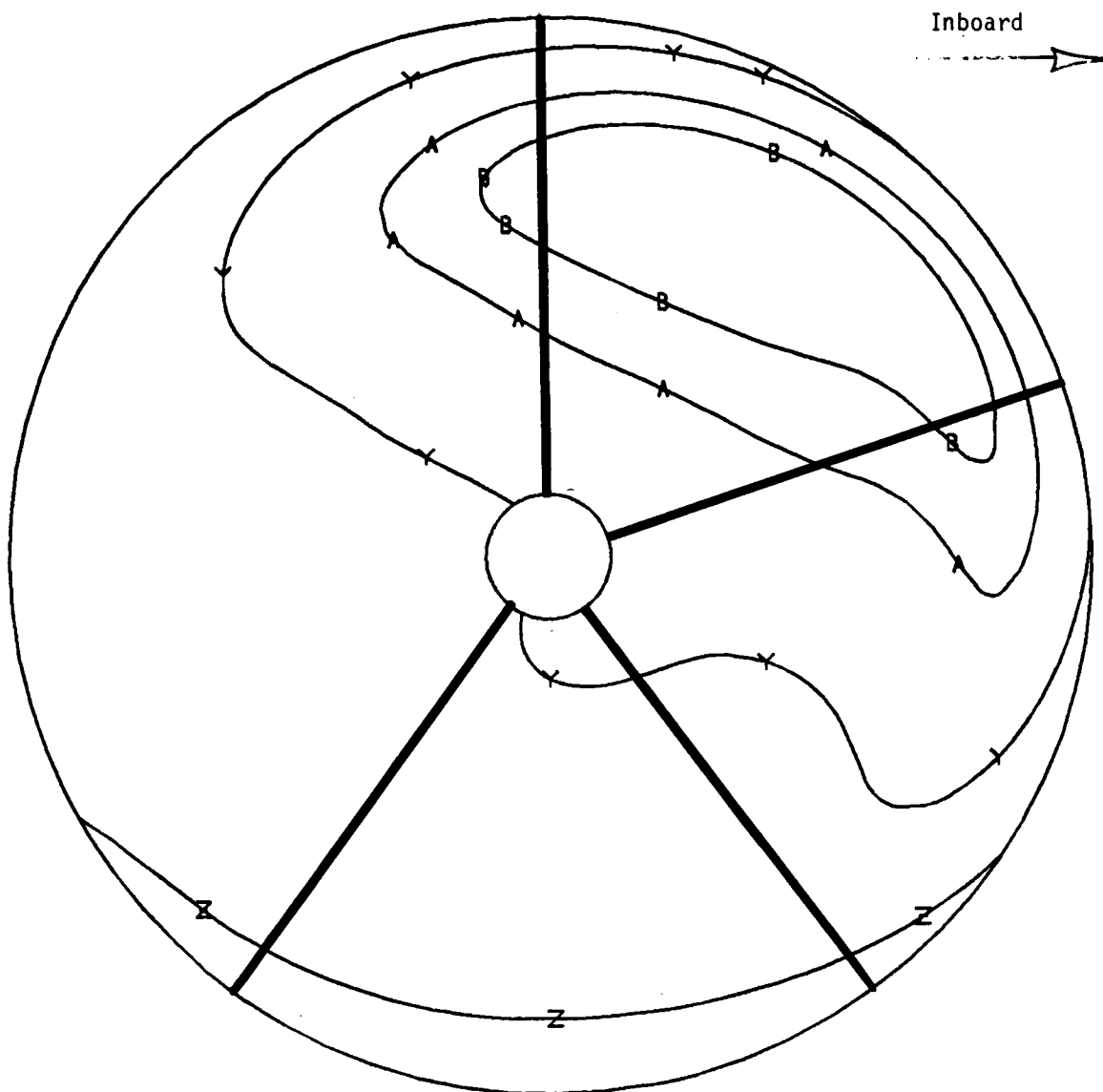
COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION  
RIGHT HAND INLET - FLOW-THROUGH MODE

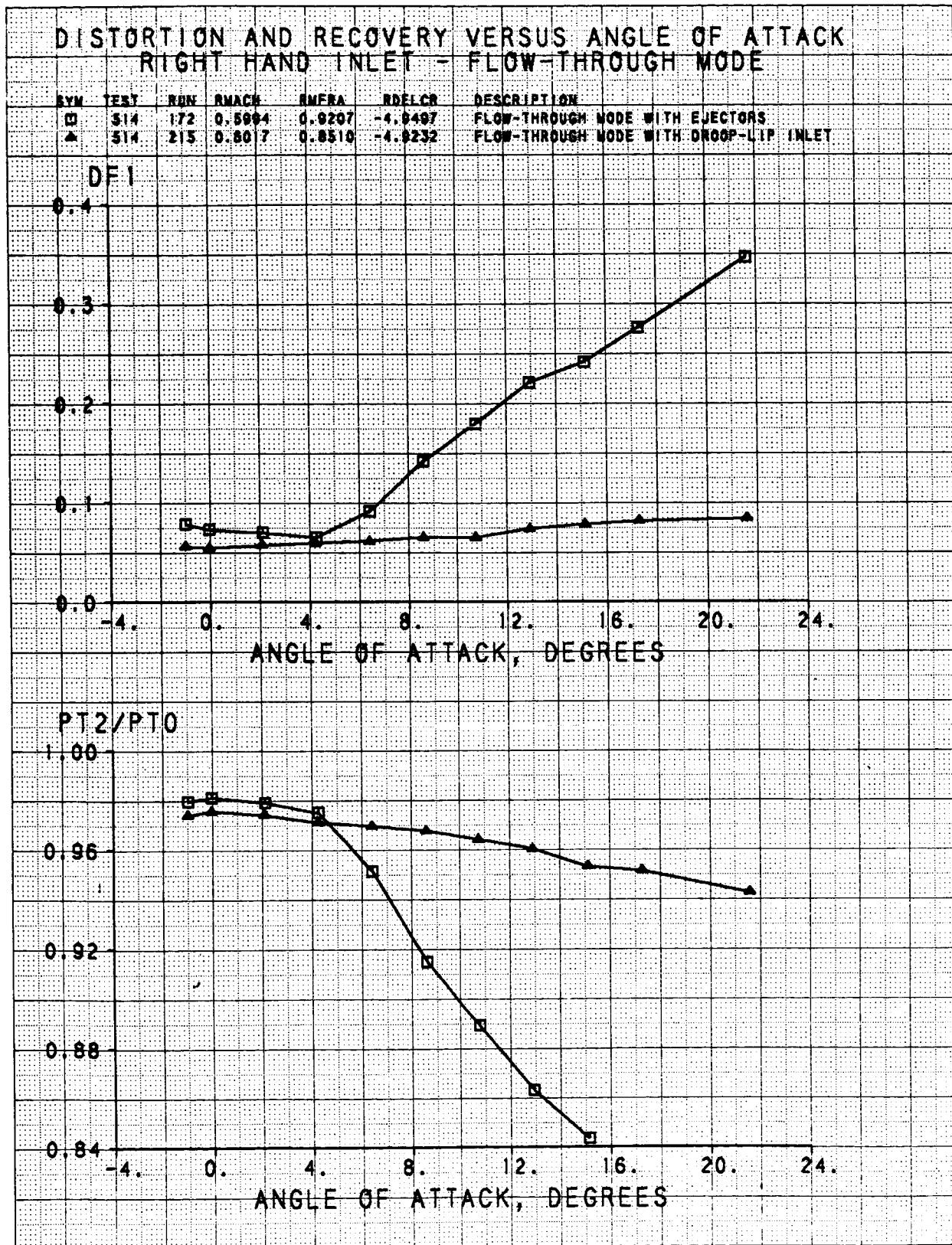
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	177	0.3985	16.871	0.9975	-0.0367	0.8703	0.1879
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—⊗—	0.80000
—*—	0.82000		—↑—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—⦿—	0.92000
—z—	0.94000		—y—	0.96000		—▲—	0.98000
—B—	0.99000						



# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

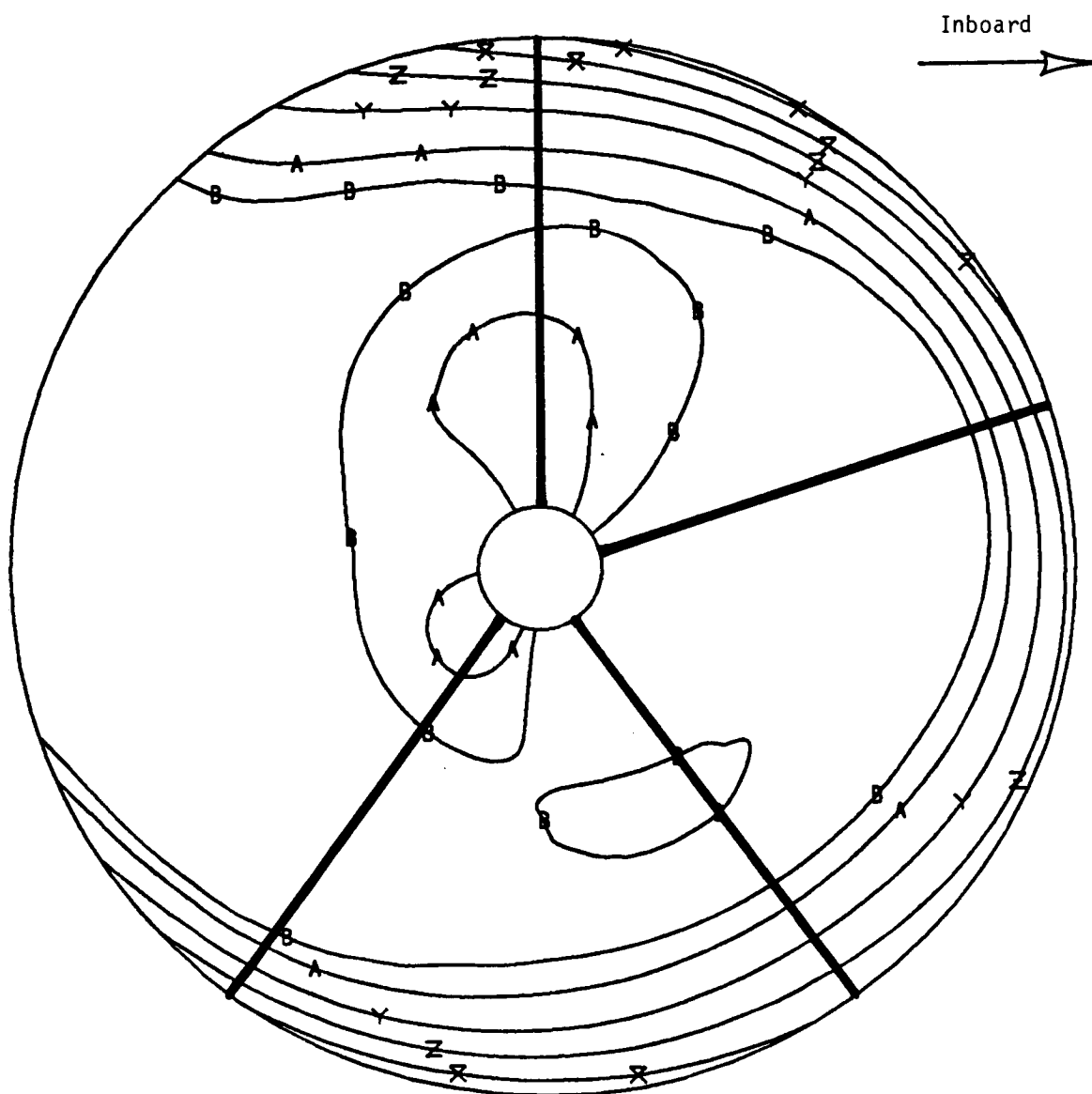
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	REC1R	DF1R
514	199	0.3999	16.965	1.0914	-0.0406	0.9642	0.0596
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—■—	0.80000
—*—	0.82000		—▲—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—×—	0.92000
—Z—	0.94000		—Y—	0.96000		—★—	0.98000
—@—	0.99000						





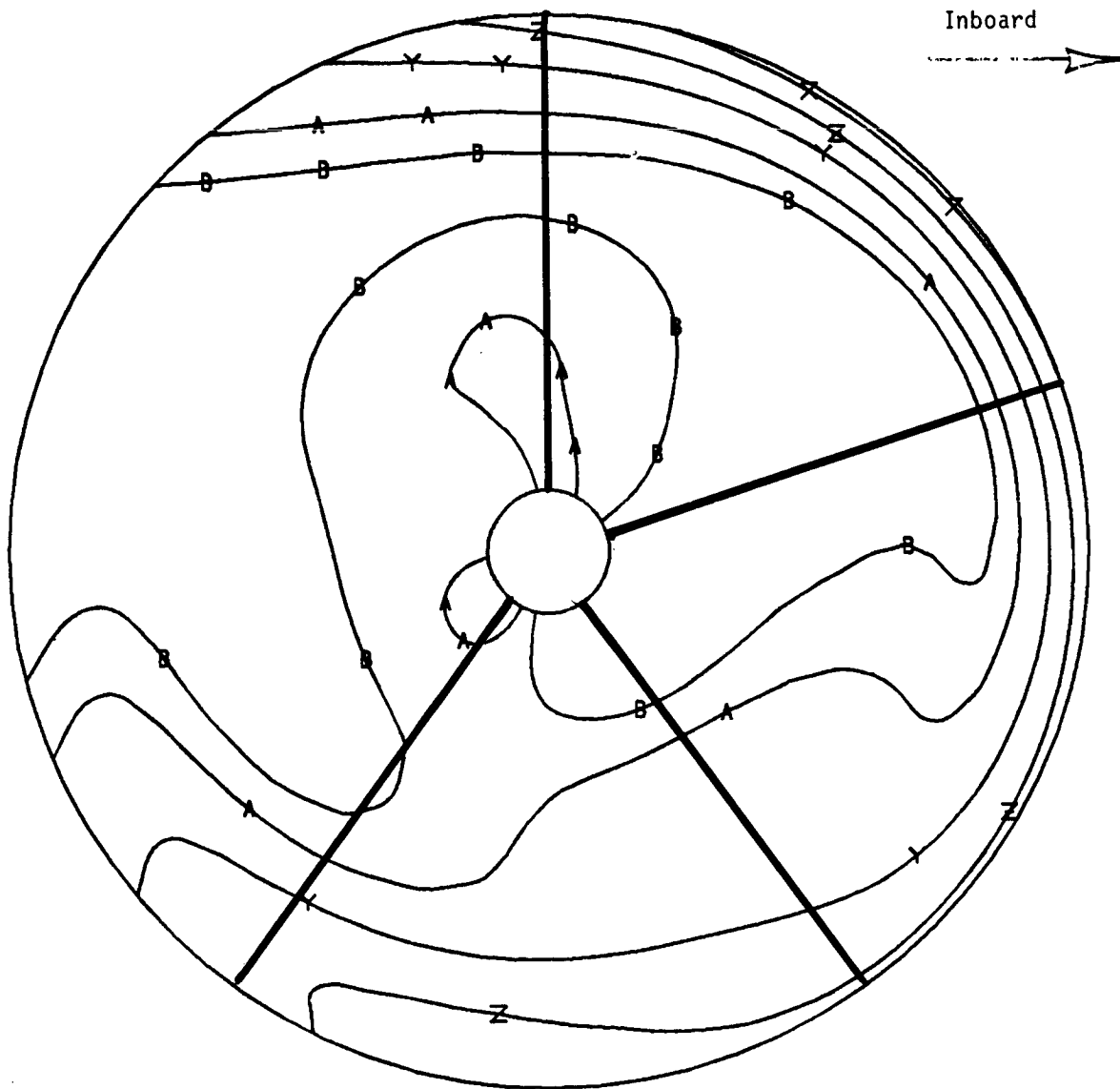
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	172	0.5994	.00428	0.9204	-4.9497	0.9809	0.0737
—■—	0.70000		—▲—	0.72000		—◆—	0.74000
—●—	0.76000		—◆—	0.78000		—■—	0.80000
—*—	0.82000		—▲—	0.84000		—x—	0.86000
—+—	0.88000		—x—	0.90000		—*—	0.92000
—z—	0.94000		—y—	0.96000		—+—	0.98000
—s—	0.99000					—s—	



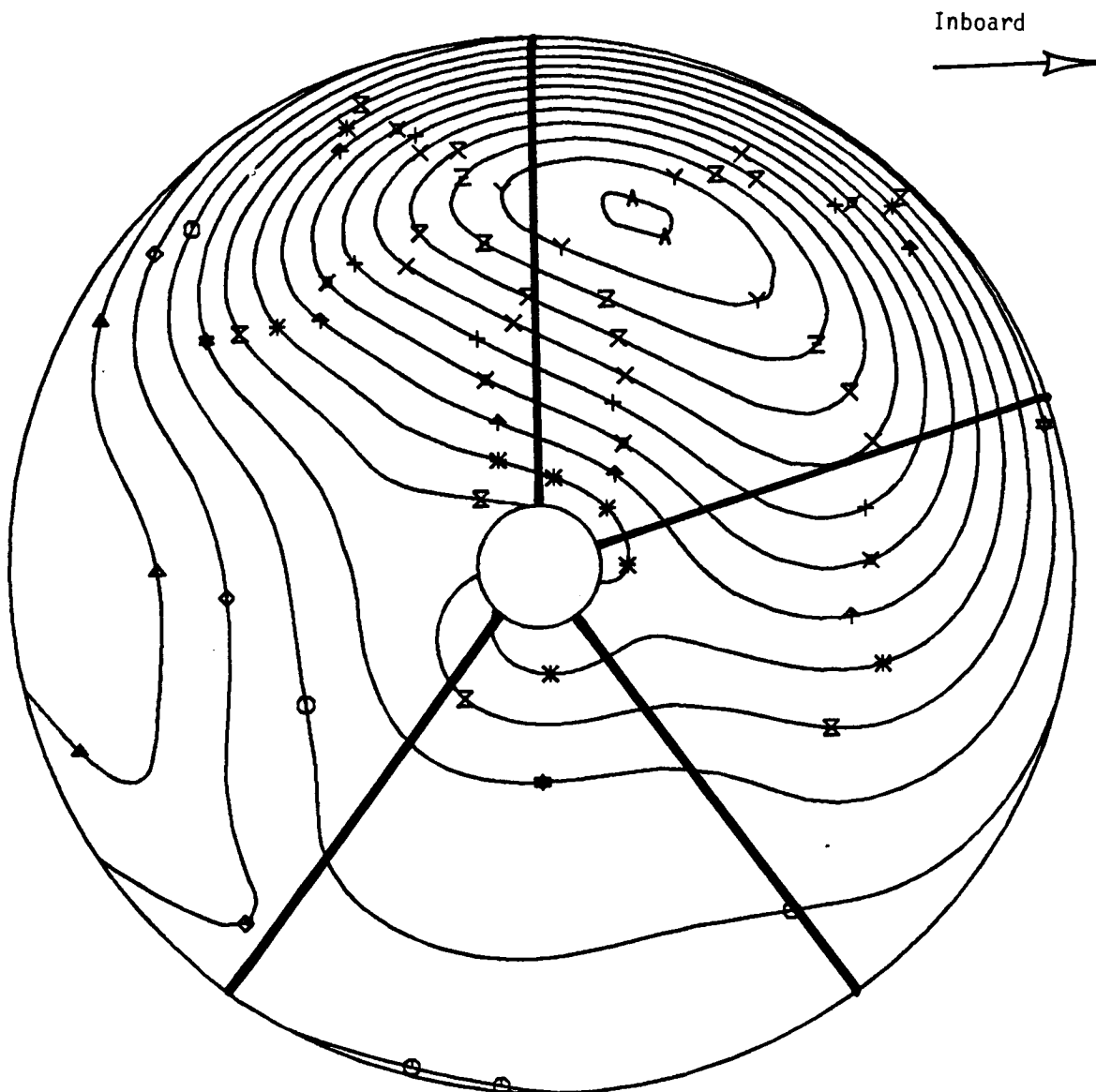
COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION  
RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	215	0.6017	-0.0187	0.8495	-4.9232	0.9755	0.0545
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—■—	0.80000
—*—	0.82000		—↑—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—✕—	0.92000
—z—	0.94000		—y—	0.96000		—★—	0.98000
—B—	0.99000						



# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

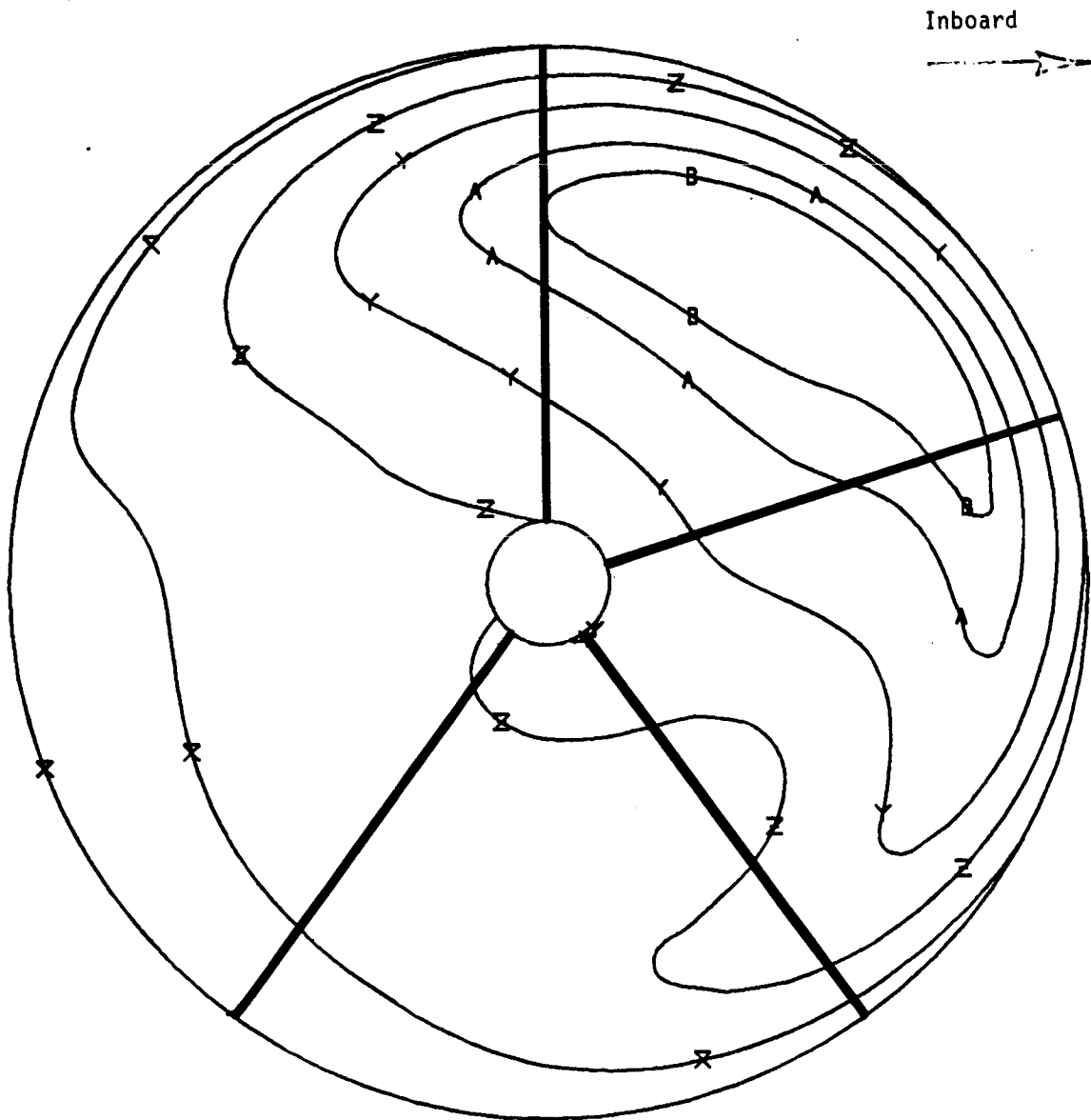
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	172	0.5994	17.299	0.7943	-4.9497	0.8199	0.2761
—□—	0.70000	—▲—	0.72000	—◆—	—	0.74000	
—○—	0.76000	—●—	0.78000	—■—	—	0.80000	
—*—	0.82000	—↑—	0.84000	—	—	0.86000	
—+—	0.88000	—×—	0.90000	—	—	0.92000	
—z—	0.94000	—y—	0.96000	—	—	0.98000	
—s—	0.99000						



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COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION  
RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

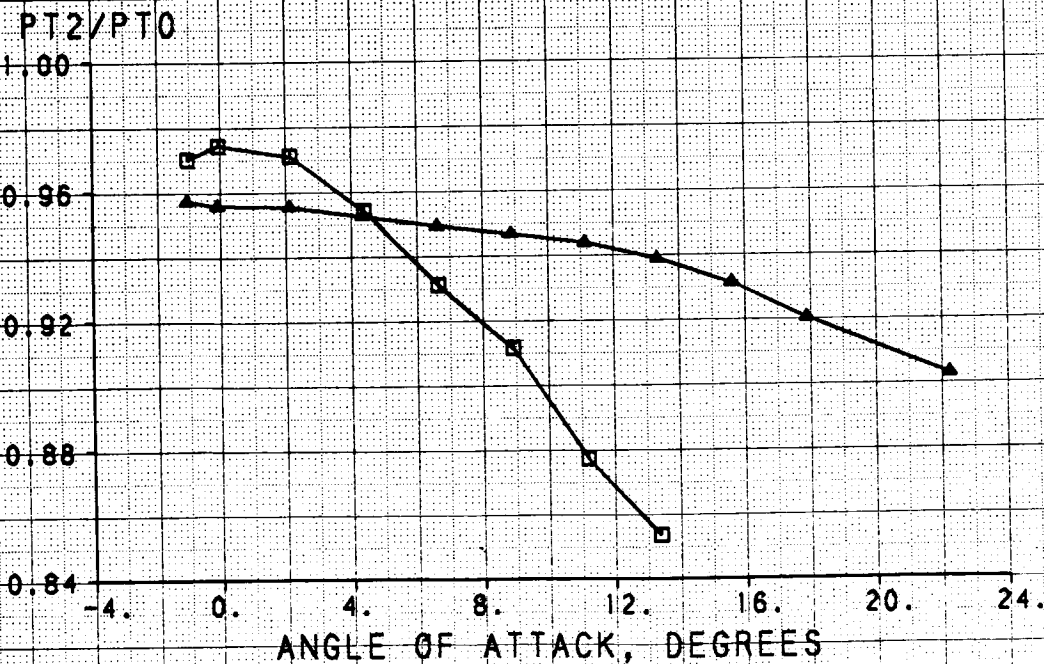
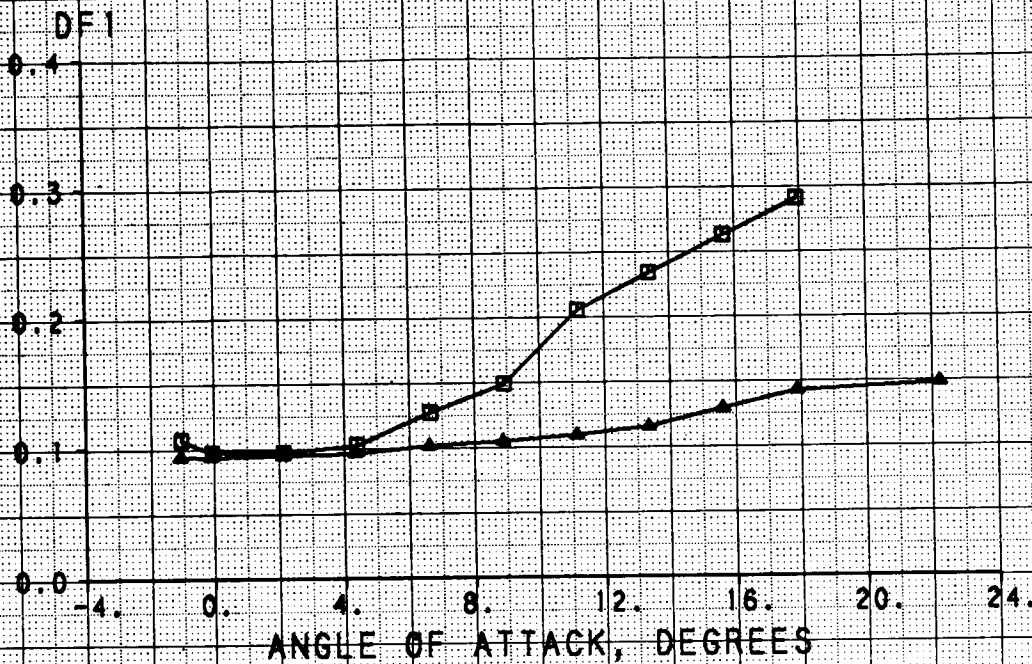
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	215	0.6017	17.276	0.8225	-4.9232	0.9515	0.0819
—□—	0.70000	—▲—	0.72000	—●—	0.74000		
—○—	0.76000	—●—	0.78000	—■—	0.80000		
—*—	0.82000	—▲—	0.84000	—×—	0.86000		
—+—	0.88000	—×—	0.90000	—*—	0.92000		
—Z—	0.94000	—Y—	0.96000	—▲—	0.98000		
—B—	0.99000						





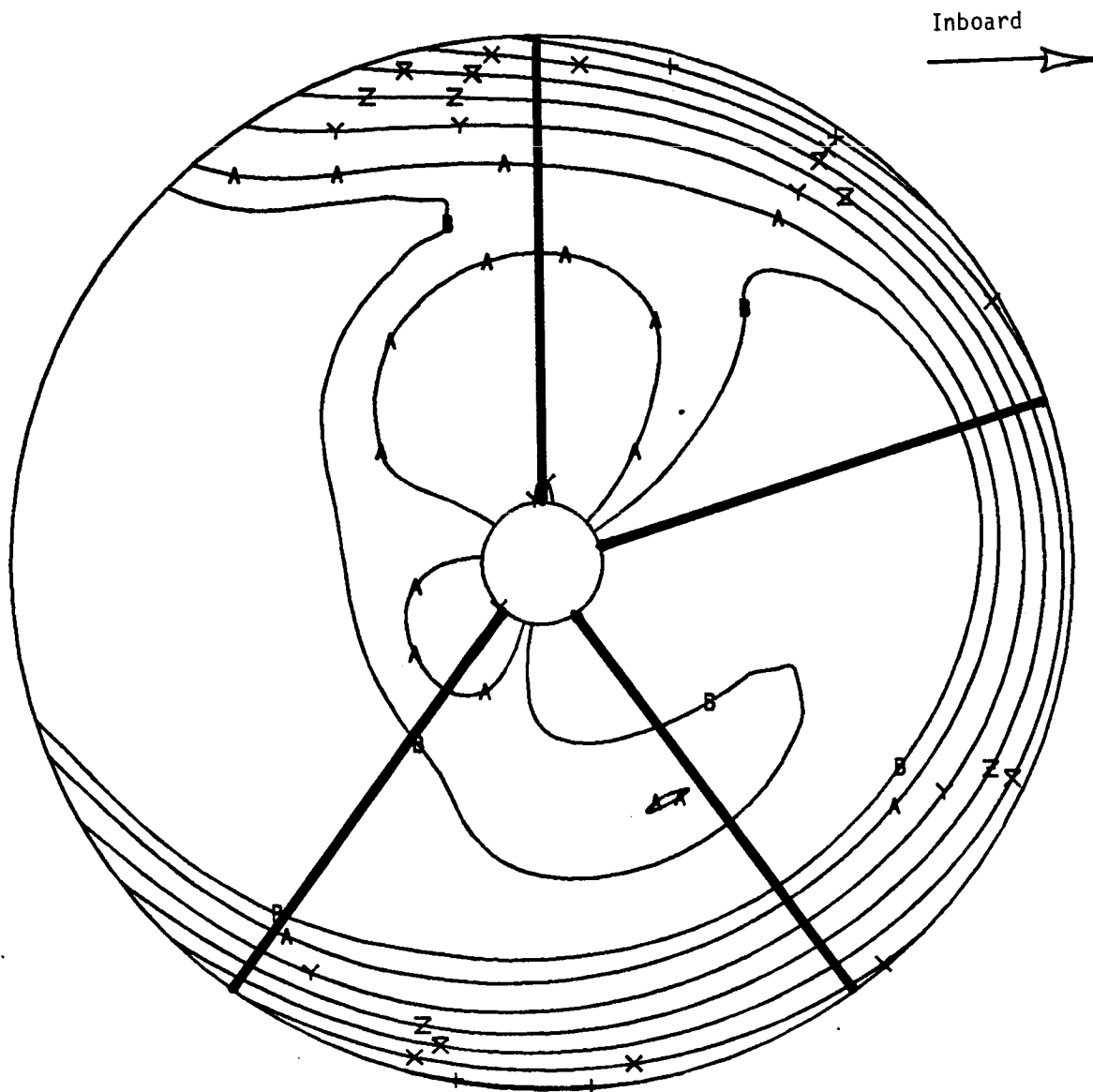
# DISTORTION AND RECOVERY VERSUS ANGLE OF ATTACK RIGHT HAND INLET - FLOW-THROUGH MODE

SYM	TEST	R/H	RMACH	RMFRA	RDELOR	DESCRIPTION
□	514	154	0.9016	0.8692	-4.9886	FLOW-THROUGH MODE WITH NOZZLE EXTENSIONS
▲	514	214	0.9075	0.8528	-5.0178	FLOW-THROUGH MODE WITH DROOP-LIP INLET



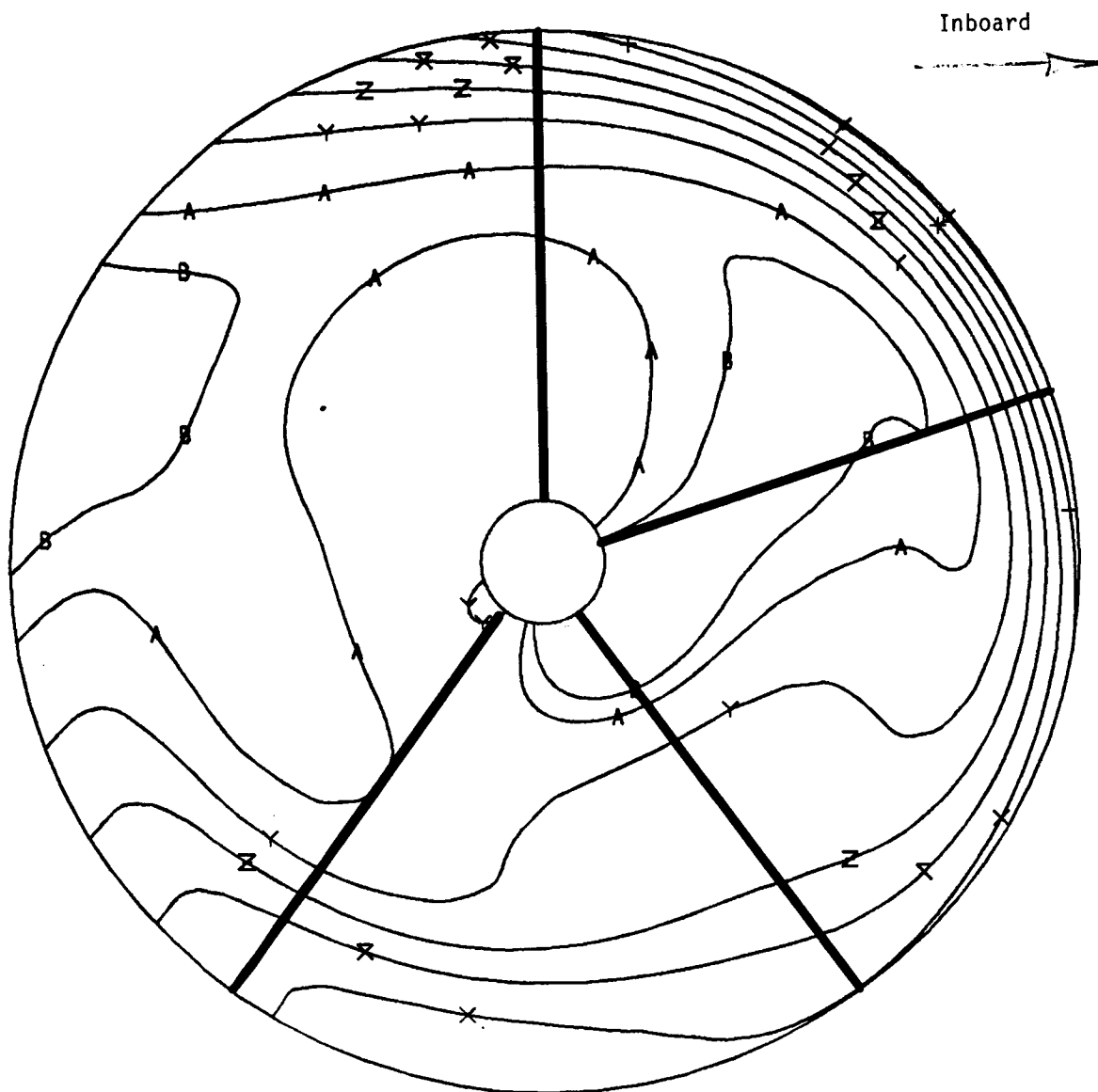
# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	156	0.9016	-0.0414	0.8699	-4.9686	0.9748	0.1000
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—⊠—	0.80000
—✱—	0.82000		—↑—	0.84000		—✕—	0.86000
—+—	0.88000		—✕—	0.90000		—✕—	0.92000
—≡—	0.94000		—Y—	0.96000		—▲—	0.98000
—●—	0.99000						



COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION  
RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

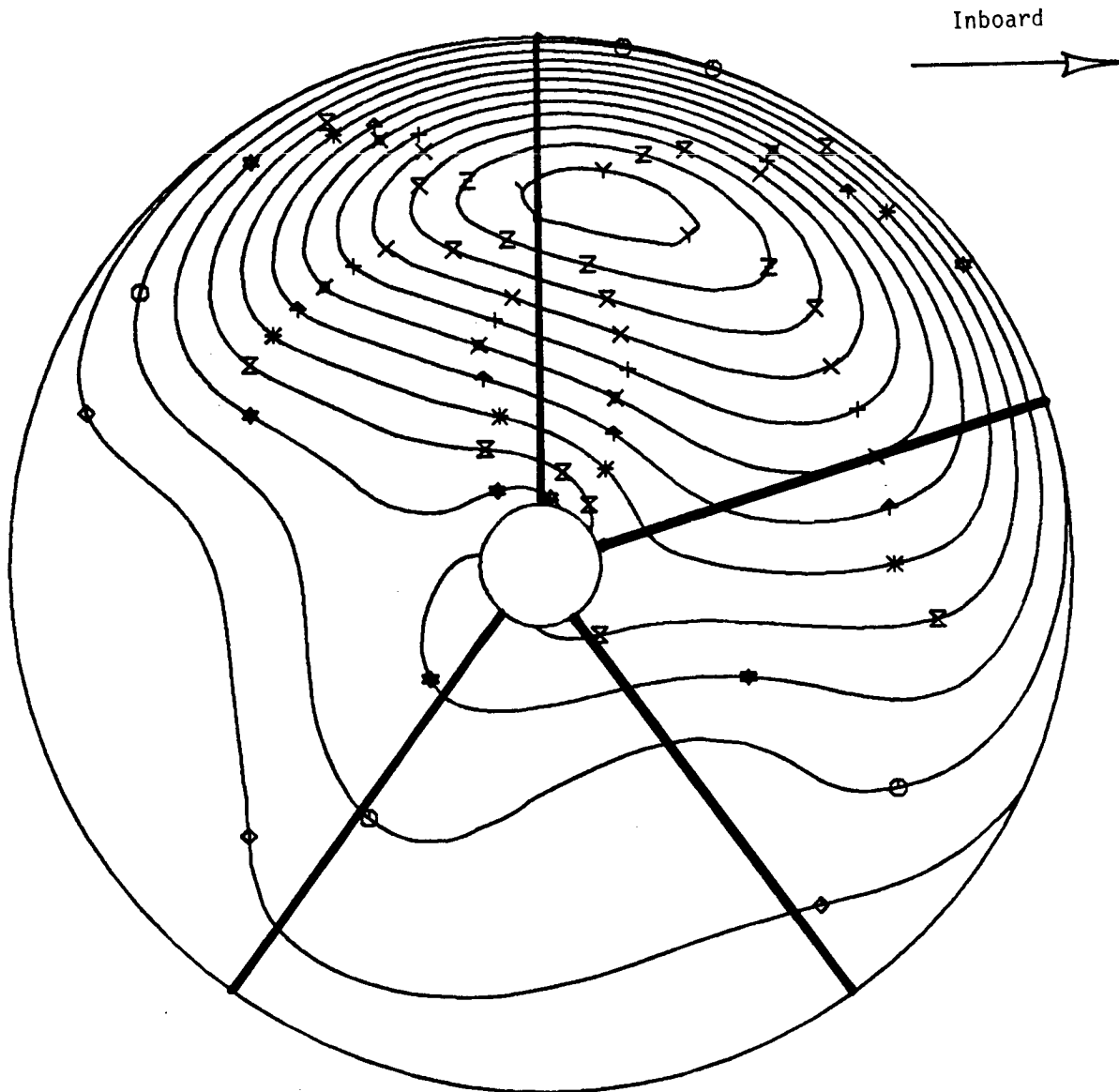
TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	214	0.9075	-0.0898	0.8535	-5.0178	0.9559	0.0938
—□—	0.70000		—▲—	0.72000		—◆—	0.74000
—○—	0.76000		—●—	0.78000		—■—	0.80000
—*—	0.82000		—↑—	0.84000		—×—	0.86000
—+—	0.88000		—×—	0.90000		—*—	0.92000
—z—	0.94000		—y—	0.96000		—▲—	0.98000
—8—	0.99000						



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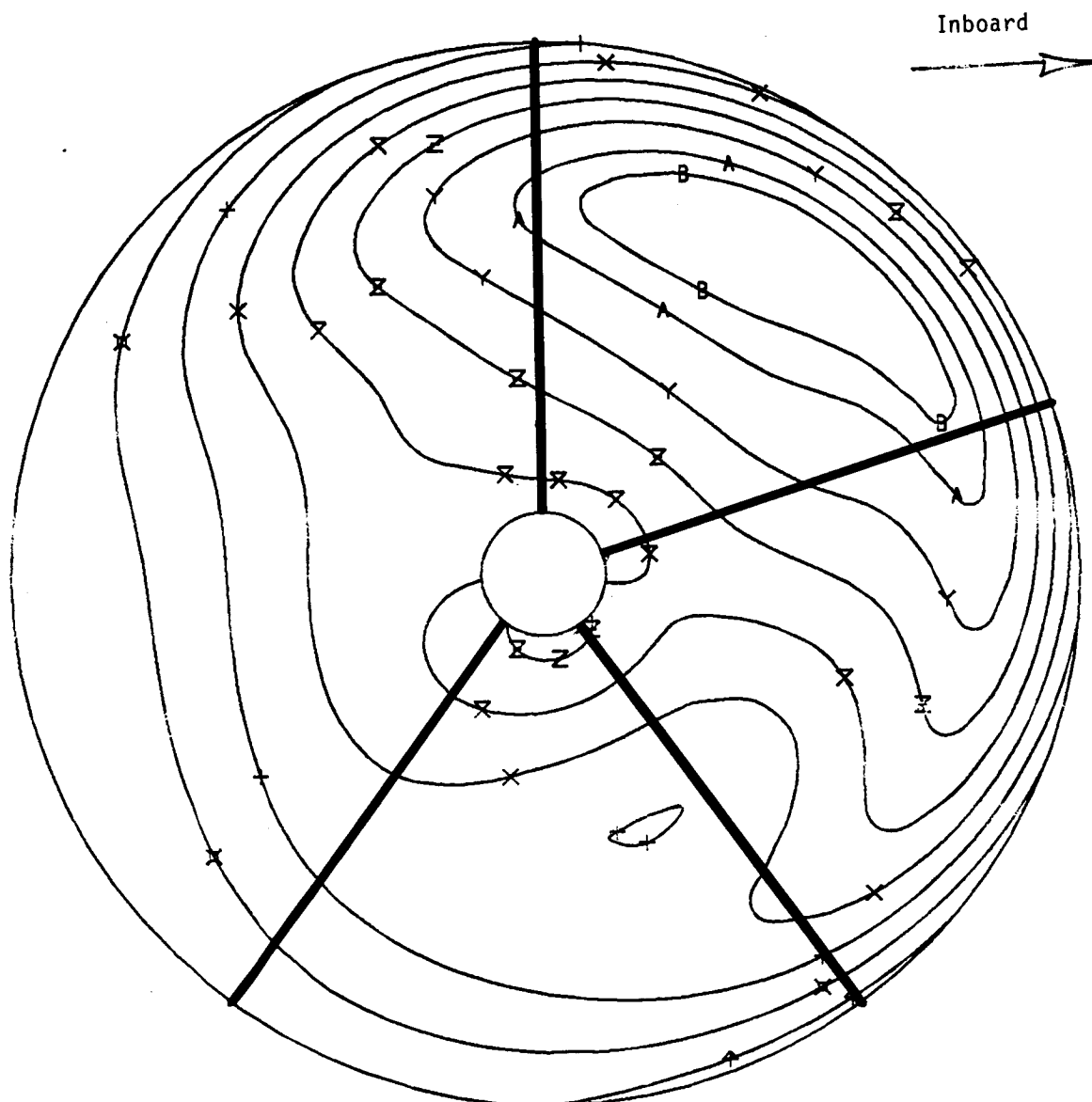
COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION  
RIGHT HAND INLET - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	156	0.9016	17.908	0.6932	-4.9686	0.8042	0.2907
—□—	0.70000	—▲—	0.72000	—◆—	—◆—	0.74000	
—○—	0.76000	—◆—	0.78000	—■—	—■—	0.80000	
—*—	0.82000	—+—	0.84000	—x—	—x—	0.86000	
—+—	0.88000	—x—	0.90000	—*—	—*—	0.92000	
—z—	0.94000	—y—	0.96000	—*—	—*—	0.98000	
—s—	0.99000						



# COMPRESSOR FACE TOTAL PRESSURE RECOVERY DISTRIBUTION RIGHT HAND INLET WITH DROOP LIP - FLOW-THROUGH MODE

TEST	RUN	RMACH	ALPHAM	MFRA	RDELCR	RECIR	DFIR
514	214	0.9075	17.872	0.8276	-5.0178	0.9205	0.1425
—□—	0.70000	—▲—	0.72000	—◆—		0.74000	
—○—	0.76000	—●—	0.78000	—⊗—		0.80000	
—*—	0.82000	—↑—	0.84000	—×—		0.86000	
—+—	0.88000	—×—	0.90000	—⊗—		0.92000	
—z—	0.94000	—y—	0.96000	—★—		0.98000	
—b—	0.99000						



APPENDIX B  
SCANIVALVE PORT ASSIGNMENTS

The Scanivalve port assignments for the three test entries are presented in this appendix. Each of the model pressure orifices along with the location on the model is presented in Table B-1. The reader is also referred to figures from Section 3 which show the relative location of model external pressure orifices. Orifices which were bad-coded are also shown in Table B-1.

TABLE B-1

ORIFICE NUMBER	ORIFICE ASSIGNMENT	SHOWN IN FIGURE NO.	MODEL STATION	BL OR WL	SCANIVALVE		
					FT	JE	SIM
102							
103							
104	Center Fuselage	3-4	10.000	0.000			
105			20.000	0.000			
106			30.000	0.000			
107			40.000	0.000			
108							
109							
110	Inner Wing	3-4	47.152	3.200	110	110	110
111			41.282	3.200	111	111	111
112	Upper Nacelle	3-4	43.189	4.810	112	112	112
113			45.189	4.810	113	113	113
114			47.189	4.810	114	114	114
115			49.189	4.810	115	115	115
116			49.189	6.324	116	116	116
117			47.189	6.324	117	117	117
118			45.189	6.324	*	*	118
119			43.189	6.324	119	119	119
120			38.000	6.324	120	120	120
121			43.189	7.836	121	121	121
122			45.189	7.836	122	122	122
123			47.189	7.836	123	123	123
124			49.189	7.836	124	124	124
125	Calibrate						
126							
127	Upper Nacelle	3-4	29.500	6.324	127	127	127
128			27.500	6.324	128	128	128
129			25.500	6.324	129	*	129
130			24.000	6.324	130	*	130
131	Leading Edge Extension	3-4	33.000	2.750	131	131	131
132			33.000	3.130	132	132	132
133			33.000	3.500	133	133	133
134			33.000	3.880	134	134	134
135			28.142	2.750	135	135	135
136			28.142	3.130	136	136	136
137			28.142	3.500	137	137	137
138			28.142	3.880	138	138	138
139							
140			50.599	8.394	140	140	140
141	Metric Break		50.599	7.788	141	141	141
142			50.599	6.324	142	142	142
143			50.599	4.860	143	143	143
144			50.599	4.254	144	144	144
145					145	145	145
146					146	146	146
146	Cavity Pressure						

\* Inoperable for entire test mode.

TABLE B-1 (Continued)

ORIFICE NUMBER	ORIFICE ASSIGNMENT	SHOWN IN FIGURE NO.	MODEL STATION	BL OR WL	SCANIVALVE		
					FT	JE	SIM
202							
203							
204	Center Fuselage	3-4		0.000			
205				0.000			
206				0.000			
207							
208	Strut Seal						
209							
210	Inner Wing	3-4	47.152	3.200	210	210	210
211			41.282	3.200	211	211	211
212	L/N Nacelle	3-4	43.189	4.810	212	212	212
213	Lower		45.189	4.810	213	213	213
214			47.189	4.810	214	214	214
215			49.189	4.810	215	215	215
216			49.189	6.324	216	216	216
217			47.189	6.324	217	217	217
218			45.189	6.324	218	218	218
219			43.189	6.324	219	219	219
220			38.000	6.324	220	220	220
221			43.189	7.836	221	221	221
222			45.189	7.836	222	222	222
223			47.189	7.836	223	223	223
224			49.189	7.836	224	224	224
225	Calibrate						
226		3-4	32.260	6.324	*	*	226
227	L/N Nacelle		29.500	6.324	227	*	227
228	Lower		27.500	6.324	228	228	228
229			25.500	6.324	229	229	229
230			24.000	6.324	230	*	230
231							
232	L/H Engine Face				232	232	232
233	Seal Cavity				233	233	233
234	R/H Engine Face				234	234	234
235	Seal Cavity				235	235	235
236	L/H Metric				236	236	236
237	Break Cavity				237	237	237
238					238	238	238
239							
240	Metric Break		50.599	7.788	240	240	240
241			50.599	6.324	241	241	241
242			50.599	4.860	242	242	242
243							
244							
245							
246							

\* Inoperable for entire test mode.



TABLE B-1 (Continued)

ORIFICE NUMBER	ORIFICE ASSIGNMENT	SHOWN IN FIGURE NO.	MODEL STATION	BL OR WL	SCANIVALVE		
					FT	JE	SIM
302							
303							
304	Upper	3-5	38.000	11.700	304	304	304
305	R/H		40.000	11.700	305	305	305
306	Nacelle		43.189	11.700	306	306	306
307			45.189	11.700	307	307	307
308			47.189	11.700	308	308	308
309			49.189	11.700	309	309	309
310							
311							
312	R/H	3-9	0°		*	312	*
313	Compressor		72°		*	*	*
314	Face		144°		*	314	*
315	Static		216°		*	315	*
316			288°		*	316	*
317							
318	Calibrate		0 - r				
319	R/H	3-9	(CM)		*	*	*
320	Compressor		0°-1.275		320	320	*
321	Face		0°-2.121		321	321	*
322	Total		0°-2.713		322	322	322
323			0°-3.198		*	323	*
324			0°-3.620		324	324	*
325			144°-1.275		325	325	325
326			144°-2.121		326	326	326
327			144°-2.713		327	327	327
328			144°-3.198		328	328	328
329			144°-3.620		329	329	*
330			216°-1.275		330	330	*
331			216°-2.121		331	331	331
332			216°-2.713		332	332	332
333			216°-3.198		333	333	333
334			216°-3.620		334	334	*
335			288°-1.275		335	335	*
336			288°-2.121		336	336	336
337			288°-2.713		337	337	337
338			288°-3.198		338	338	338
339			288°-3.620		339	339	339
340							
341							
342							
343							
344							
345	R/H Camp Face	3-9	72°-AV		345	345	345
346							

\* Inoperable for entire test mode.

TABLE B-1 (Continued)

ORIFICE NUMBER	ORIFICE ASSIGNMENT	SHOWN IN FIGURE NO.	MODEL STATION	BL OR WL	SCANIVALVE		
					FT	JE	SIM
402							
403							
404	Lower	3-5	38.000	3.400	404	404	404
405	R/H		40.000	3.400	405	405	405
406	Nacelle		43.189	3.400	406	406	406
407			45.189	3.400	407	407	407
408			47.189	3.400	408	408	408
409			49.189	3.400	409	409	409
410							
411							
412	L/H Compressor	3-10			*	*	*
413	Statics				413	413	413
414							
415							
416	Strut				416	416	416
417	Seal				417	417	417
418	Cavity				418	418	418
419							
420	Lower R/H				*	*	*
421	Metric Break				*	*	*
422	Upper R/H				*	*	*
423	Metric Break				*	*	*
424							
425	Calibrate						
426							
427	L/H	3-10			*	*	*
428	Compressor						
429	Total						
430							
431			0 - r				
432			(CM)		*	*	*
433			144°-1.275		433	433	433
434			144°-2.121		434	434	434
435			144°-2.713		435	435	435
436	Compressor	3-10	144°-3.198		436	436	436
437	Total		144°-3.620		437	437	437
438			288°-AV		438	438	438
439							
440							
441							
442							
443							
444							
445							
446							

\*Inoperable for entire test mode.

TABLE B-1 (Continued)

ORIFICE NUMBER	ORIFICE ASSIGNMENT	SHOWN IN FIGURE NO.	MODEL STATION	BL OR WL	SCANIVALVE		
					FT	JE	SIM
502							
503							
504	Upper	3-6	51.235	4.400	504	504	535
505	L/H		52.485	4.810	505	505	518
506	Nozzle		54.985	4.400	506	506	514
507			54.985	4.810	507	507	530
508			56.235	4.810	508	508	508
509			57.535	4.810	509	509	537
510			58.735	4.810	510	510	531
511			58.735	5.567	511	511	511
512							
513			56.235	5.567	513	513	539
514			53.735	5.567	514	514	*
515			52.485	5.567	515	515	513
516			51.235	5.567	516	516	528
517			52.485	6.324	*	517	517
518			53.735	6.324	*	518	527
519			54.985	6.324	*	519	519
520			57.535	6.324	520	520	510
521			58.735	6.324	521	521	529
522			58.735	7.081	522	522	521
523							
524							
525							
526	Upper						
527	L/H		56.235	7.081	527	527	*
528	Nozzle		53.735	7.081	528	528	*
529			52.485	7.081	529	529	*
530			51.235	7.081	530	530	*
531			51.235	8.200	531	531	*
532			52.485	7.836	532	532	504
533			54.985	8.200	533	533	505
534			54.985	7.836	534	534	*
535			56.235	7.836	535	*	533
536	Nozzle		57.535	7.836	536	536	536
537			58.735	7.836	537	537	522
538	Upper Inner	3-4					
539	Wing		53.031	3.200	*	646	539
540							
541	BL 16.031 R/H	3-3	60%	16.031	541	541	541
542	Upper		40%	16.031	542	542	
543	Wing		20%	16.031	543	543	543
544	BL 16.031 R/H		20%	16.031	544	544	544
545	Lower		40%	16.031	545	545	545
546	Wing		60%	16.031	546	546	546

\* Inoperable for entire test mode.

TABLE B-1 (Continued)

ORIFICE NUMBER	ORIFICE ASSIGNMENT	SHOWN IN FIGURE NO.	MODEL STATION	BL OR WL	SCANIVALVE		
					FT	JE	SIM
602	Lower Fuselage	3-4					
603	Centerline						
604	Lower	3-6	51.235	4.810	604	*	606
605	R/H		52.585	4.400	605	605	611
606	Nozzle		53.735	4.810	606	606	604
607			54.470	4.400	607	607	622
608			55.204	4.810	608	608	623
609			55.204	5.567	609	609	614
610			53.735	5.567	610	610	616
611			51.235	5.567	611	611	*
612			52.585	6.324	612	612	*
613			53.735	6.324	613	613	615
614			54.470	6.324	614	614	605
615			55.204	6.324	615	615	613
616			55.204	7.081	616	616	610
617			53.735	7.081	617	617	607
618			51.235	7.081	618	618	620
619			51.235	7.836	619	619	621
620			52.585	8.200	620	620	619
621			53.735	7.836	621	621	618
622			54.470	8.200	622	622	612
623			55.204	7.836	623	623	609
624	Calibrate						
625	BL 19.237 R/H	3-3	60%	19.237	625	625	625
626	Upper		40%	19.237	626	626	626
627	Wing		20%	19.236	627	627	627
628	BL 19.237		20%	19.237	628	628	628
629	Lower		40%	19.237	629	629	629
630	Wing		60%	19.237	630	630	630
631	Upper	3-2	95%	12.825	*	631	631
632	L/H		75%	12.825	632	632	632
633	Wing		60%	12.825	633	633	633
634			40%	12.825	634	634	634
635			20%	12.825	635	635	635
636	Upper	3-2	15%	12.825	*	*	*
637	L/H		10%	12.825	637	637	637
638	Wing		5%	12.825	*	638	638
639			1.5%	12.825	639	*	639
640	Lower		1.5%	12.825	640	640	640
641	L/H		10%	12.825	641	*	641
642	Wing		20%	12.825	642	*	642
643			40%	12.825	643	643	643
644			60%	12.825	*	644	644
645			90%	12.825	645	645	645
646	Inner Wing	3-4	54.930	3.200	539	539	646

\* Inoperable for entire test mode.

TABLE B-1 (Continued)  
NOZZLE EXTENSION TUBE CONFIGURATIONS

ORIFICE NUMBER	ORIFICE ASSIGNMENT	SHOWN IN FIGURE NO.	MODEL STATION	BL OR WL	SCANIVALVE		
					FT	JE	SIM
502					N/A		
503							
504	Nozzle	3-7	52.485	4.810	513		508
505	Extension		54.985	4.810	519		533
506	Tubes		57.985	4.810	*		*
507	Statics		51.235	6.324	*		539
508			52.485	6.324	*		*
509			53.735	6.324	509		510
510			54.985	6.324	510		520
511			56.235	6.324	518		516
512			57.535	6.324	507		*
513			52.485	7.836	517		530
514			54.985	7.836	504		528
515			57.535	7.836	*		531
516							
517	Nozzle				*		535
518	Extension				529		527
519	Total				521		536
520	Pressures				530		517
521					531		532
523							
524							
525							
526	L/H				532		526
527	Nozzle Ext.				520		514
528	Total				*		521
529	Pressures				528		513
530							
531	Choke				533		522
532	Static				536		534
533	L/H				534		509
534					537		537
535							
536							
537							
538	Upper Inner	3-4					
539	Wing		53.031	3.200	*		539
540							
541	BL 16.031 R/H	3-3	60%	16.031	541		541
542	Upper		40%	16.031	542		542
543	Wing		20%	16.031	543		543
544	BL 16.031 R/H		20%	16.031	544		544
545	Lower		40%	16.031	545		545
546	Wing		60%	16.031	546		546

\* Inoperable for entire test mode.

TABLE B-1 (Continued)  
NOZZLE EXTENSION TUBE CONFIGURATIONS

ORIFICE NUMBER	ORIFICE ASSIGNMENT	SHOWN IN FIGURE NO.	MODEL STATION	BL OR WL	SCANIVALVE		
					FT	JE	SIM
602							
603						N/A	
604	Choke				617		605
605					620		606
606	Static				621		607
607	R/H	3-7	51.235	6.324	*		511
608	Lower		52.585	6.324	*		519
609	Extension		53.735	6.324	505		505
610	Tube		54.470	6.324	516		507
616	Static		55.204	6.324	*		506
612	Choke Static				612		608
613							
614	R/H				606		604
615	Extension				610		613
616	Tube				608		604
617	Totals				607		609
618					616		622
619					613		623
620					605		615
621					622		617
622					611		612
623							
624	Calibrate						
625	BL 19.237 R/H	3-3	60%	19.237	625		625
626	Lower		40%	19.237	626		626
627	Wing		20%	19.237	627		627
628	BL 19.237 R/H		20%	19.237	628		628
629	Upper		40%	19.237	629		629
630	Wing		60%	19.237	630		630
631	Upper	3-2	95%	12.825	*		631
632	L/H		75%	12.825	632		632
633	Wing		60%	12.825	633		633
634			40%	12.825	634		634
635			20%	12.825	635		635
636	Upper	3-2	15%	12.825	*		636
637	L/H		10%	12.825	637		637
638	Wing		5%	12.825	*		638
639			1.5%	12.825	639		639
640	Lower		1.5%	12.825	640		640
641	L/H		10%	12.825	641		641
642	Wing		20%	12.825	642		642
643			40%	12.825	643		643
644			60%	12.825	*		644
645			90%	12.825	645		645
646	Inner Wing	3-4	54.930	3.200	539		646

\*Inoperable for entire test mode.



APPENDIX C  
TEST MATRICES

The Phase 3 wind tunnel tests were performed over the range  $M = 0.4-1.4$ . Each run comprised either an Angle of Attack ( $\alpha$ ) sweep or a Nozzle Pressure Ratio (NPR) sweep. The run matrix for each test mode is presented in this appendix.



Flow-Through Test Mode

Configuration	$\delta_c$	0.4	0.6	0.9	1.2	1.4
Common Baseline A/B ALBEN $\delta_N = 0^\circ$ $\delta_F = 0^\circ$	5	66	75	77	82	93
	0	67	74	78	85	92
	-5	68	73	79	86	94
	-10	69	72	80	87	95
	-15	70	71	81	-	-
Nozzle Extension 2 $A_{choke} = 12.49 \text{ cm}^2$ (1.936 in <sup>2</sup> )		Ejectors	Ejectors			
			With W/O			
	5	186	-	-	-	-
	0	187	111 194	118	121	124
	-5	188	112 193	117	120	123
$A_{choke} = 18.74 \text{ cm}^2$ (2.907 in <sup>2</sup> )	-10	189	113 192	116	119	122
	-15	190	114 191	115	-	-
	5	204	-	-	-	-
	0	205	136 212	132	129	126
	-5	206	137 211	133	130	127
$A_{choke} = 26.11 \text{ cm}^2$ (4.047 in <sup>2</sup> )	-10	207	138 210	134	131	128
	-15	208	139 209	135	-	-
	5	176	-	-	-	-
	0	177	153 181	146	145	142
	-5	178	152 182	147	144	143
$A_{choke} = 34.25 \text{ cm}^2$ (5.309 in <sup>2</sup> )	-10	179	151 183	148	-	-
	-15	180	150 184	149	-	-
	5	164	-	-	-	-
	0	165	170 -	155	160	161
	-5	167	171 -	156	159	162
	-10	168	172 -	157	-	-
	-15	169	173 -	158	-	-

Flow-Through Test Mode

Configuration	$\delta_c$	0.4	0.6	0.9	1.2	1.4
Nozzle Extension $\delta_F = 30^\circ$ Cowl Lip = $45^\circ$ $A_{choke} = 12.49 \text{ cm}^2$ (1.936 in <sup>2</sup> )	5	Ejectors 196				
	0	197				
$A_{choke} = 18.74 \text{ cm}^2$ (2.907 in <sup>2</sup> )	5	203				
	0	201 202				
$A_{choke} = 26.11 \text{ cm}^2$ (4.047 in <sup>2</sup> )	5	200				
	0	199				
Nozzle Extension $\delta_F = 0^\circ$ Cowl Lip = $45^\circ$ $A_{choke} = 34.25 \text{ cm}^2$ (5.309 in <sup>2</sup> )	-5		215	214		
Nozzle Extension Baseline	0	-	-	-	219	217/218
	-5	224	223	220 222 221	-	-
	-15	-	-	-	-	-

Configuration	$\delta_c$	0.4						0.6						0.9						1.2						1.4					
		$\alpha=0$			$\alpha=0$ NPR Sweeps	$\alpha=0$			$\alpha=0$ NPR Sweeps	$\alpha=0$			$\alpha=0$ NPR Sweeps	$\alpha=0$			$\alpha=0$ NPR Sweeps	$\alpha=0$			$\alpha=0$ NPR Sweeps	$\alpha=0$			$\alpha=0$ NPR Sweeps						
		$\alpha$ -Sweeps				$\alpha$ -Sweeps				$\alpha$ -Sweeps				$\alpha$ -Sweeps				$\alpha$ -Sweeps				$\alpha$ -Sweeps									
		Jet	Off	On		Jet	Off	On		Jet	Off	On		Jet	Off	On		Jet	Off	On		Jet	Off	On		Jet	Off	On			
A/B ALBEN $\delta_N=0^\circ \quad \delta_F=0^\circ$	5 0 -5 -10 -15	239 240 237 238 241 242	257 237 258	248 256	243 259	260	244 250 262	249 261	245 252	251	246 254	253																			
A/B ALBEN $\delta_N=20^\circ \quad \delta_F=0^\circ$	0 -5 -10 -15	273	271	272	268 270	269	274 265 275 276 277 278	266	284 282	283																					
A/B ALBEN $\delta_N=30^\circ \quad \delta_F=30^\circ$	5 0 -5	297 298 299	292 289 290 288 291 287 293 294	286																											
Dry ALBEN $\delta_N=0^\circ \quad \delta_F=0^\circ$	0 -5	302 303	321 305 320	304 307	312 313 314	310	318 319 315	316																							

## CMAPS MODE

Configuration	$\delta_c$	Alpha-Sweeps				
		0.4	0.6	0.9	1.2	1.4
Common Baseline A/B ALBEN $\delta_N = 0^\circ$ $\delta_F = 0^\circ$	5	104	109	110	111	112
	0	105				
	-5	106				
	-10	107				
	-15	108				
Nozzle Extensions *Percent Design Corrected Flow Rate: 38%	5	26	-	-	-	-
	0	30	47	59	71	79
	-5	34	51	63	75	83
	-10	38	55	67	-	-
	-15	42	-	-	-	-
58%	5	27	-	-	-	-
	0	31	52	60	72	80
	-5	35	48	64	76	84
	-10	39	56	68	-	-
	-15	43	-	-	-	-
84%	5	28	-	-	-	-
	0	32	53	61	73	81
	-5	36	49	65	77	85
	-10	40	57	69	-	-
	-15	44	-	-	-	-
96% @ M = 0.4, 0.6  106% @ M = 0.9, 1.2, 1.4	5	29	-	-	-	-
	0	33	54	62	74	82
	-5	37	50	66	78	86
	-10	41	57	70	-	-
	-15	45	-	-	-	-

\*Design Corrected Flow Rate:

0.7049 kg/sec

(1.554 lb/sec)

Simulator Mode  
Mach = 0.6  
ALBEN A/B  $\delta_N = 0^\circ$

EPR - Sweeps

*Percent Design Corrected Flowrate	$\delta_c$	AOA			
		0°	4°	8°	16°
38%	0	114	131	146	-
	-5	120	136	151	-
	-10	125	141	156	-
58%	0	115	132	147	161
	-5	121	137	152	166
	-10	126	142	157	170
71%	0	116	133	148	162
	-5	122	138	153	167
	-10	127	143	158	171
84%	0	117	134	149	163
	-5	123	139	154	168
	-10	128	144	159	172
97%	0	118	135	150	164/165
	-5	124	140	155	169
	-10	129	145	160	173

\*Design Corrected Flow Rate =

0.7049 kg/sec  
(1.554 lb/sec)

Simulator Mode  
a-Sweeps

*Percent Design Flow Rate	Mach																							
	0.4						0.6						0.9						1.2					
	EPR	1.5	1.8	2.2	2.6	3.0	EPR	1.5	1.8	2.2	2.6	3.0	EPR	1.5	1.8	2.2	2.6	3.0	EPR	1.5	1.8	2.2	2.6	3.0
38%	0 266 267 268 281																							
58%	0 266 267 268 281																							
71%	0 266 267 268 281																							
84%	0 269 270 271 272 273																							
96%	0 269 270 271 272 273																							
106%	0 269 270 271 272 273																							

\*Design Corrected Flow Rate:

0.7049 kg/sec  
(1.554 lb/sec)

1. Report No. NASA CR-177343-VOL-1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle PROPULSION AND AIRFRAME AERODYNAMIC INTERACTIONS OF SUPERSONIC V/STOL CONFIGURATIONS VOLUME I: WIND TUNNEL TEST PRESSURE DATA REPORT				5. Report Date Sept 85	
				6. Performing Organization Code	
7. Author(s) D. E. Zilz and P. A. Devereaux				8. Performing Organization Report No.	
9. Performing Organization Name and Address McDonnell Aircraft Company P.O. Box 516 St. Louis, Missouri 63166				10. Work Unit No. T-3288Y	
				11. Contract or Grant No. NAS2-10791	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546				13. Type of Report and Period Covered Contractor Report	
				14. Sponsoring Agency Code 505-43-01	
15. Supplementary Notes Point of Contact: Technical Monitor, Rodney O. Bailey (415) 694-6265 Ames Research Center, Moffett Field, CA 94035					
16. Abstract  A wind tunnel model of a supersonic V/STOL fighter configuration has been tested to measure the aerodynamic interaction effects which can result from geometrically close-coupled propulsion system/airframe components. The approach was to configure the model to represent two different test techniques. One was a conventional test technique composed of two test modes. In the Flow-Through mode, absolute configuration aerodynamics are measured, including inlet/airframe interactions. In the Jet-Effects mode, incremental nozzle/airframe interactions are measured. The other test technique is a propulsion simulator approach, where a sub-scale, externally powered engine is mounted in the model. This allows proper measurement of inlet/airframe and nozzle/airframe interactions simultaneously.					
17. Key Words (Suggested by Author(s)) Flowfield Interactions Propulsion Simulators Supersonic V/STOL			18. Distribution Statement  [REDACTED] Until August 1987  Star Category 02		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 871	
				22. Price*	